

MEMO

TO: CADD Users

FROM: CADD Committee; Ron Henke (chairperson), Jon Collado, Diane Gunsch, Nancy Horner, Diane Laub, DeLane Meier, Brian Raschke and Joyce Schmidt (secretary)

DATE: July 26, 2007

SUBJECT: CADD Standards Implementation

The North Dakota Department of Transportation (NDDOT) wants to stress the importance of following the CADD Standards. These standards increase the readability and consistency of design plans. When the format is consistent, readers can find information quicker and a standard level of professionalism is met and maintained.

CADD Standards are also needed for automation. CADD Standards allow applications such as MicroStation and GEOPAK to work together. CADD tools and settings can be adjusted for one particular way of drawing and designing. These tools can be set up once and used on multiple projects. In order to make the most of these tools, the CADD Standards need to be used. The NDDOT is expecting full implementation of the standards. **The CADD Standards must be followed.**

If you are having difficulties applying the CADD Standards to a particular task, please contact the CADD Specialist or a CADD Standards Representative.

20/jdc

CADD Standards

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Support

1.1 Manuals and Tutorials

Oct 2008

The following is a list of references available to NDDOT users.

The **CADD Standards** manual is available on the NDDOT Internet Web site: www.dot.nd.gov/manuals/design/caddmanual/caddmanual.pdf. Users should review this web site for all future revisions.

Axiom manuals are available on the NDDOT CADD server. These manuals are located under their respective folders under M:\APPS\Production\Design\AxiomV8.

The **NDDOT Digital InterPlot** manual is available on the NDDOT intranet site: <http://mydot.nd.gov/manuals/caddrelated/dip/dip.htm>.

The **NDDOT GEOPAK Road1** manual is available on the NDDOT intranet site: <http://mydot.nd.gov/manuals/caddrelated/geopakroad1/geopakroad1.htm>.

The **NDDOT Surveys to As-built** manual is available on the NDDOT intranet site: <http://mydot.nd.gov/manuals/caddrelated/asbuilt/asbuilt.htm>.

The **Procedures for Calculating Final Earthwork Quantities** manual is available on the NDDOT intranet site: www.dot.nd.gov/manuals/design/caddmanual/nddot-procedures-for-calculating-final-earthwork-quantities.pdf.

The **Complete Knuckleheads Guide to Using GEOPAK**: www.wfl.fhwa.dot.gov/design/cadd/idiotxm.

CADD Standards

1.2 The CADD Specialist and Support Contacts

Oct 2008

The CADD Specialist (Jon Collado, 328-4439) provides technical engineering-related support for CADD programs. His other duties include:

- Researching and maintaining CADD technologies
- Providing application specific training
- Coordinating engineering-related standards development and implementation

The CADD Specialist is the primary contact for technical engineering-related CADD support questions. Support from co-workers is also important. Here is a list of other users who may be able to help you:

GEOPAK - Survey / DTM:
Troy Zornjak, Paul Stubbs

GEOPAK - Alignments / COGO:
Chad Frisinger, Ranka Samardzic

GEOPAK - Earthwork:
Chad Frisinger, Ranka Samardzic

MicroStation:
Deb Fahlsing, Connie Schafer, Travis Cork, Paul Stubbs

Information Technology:
Diane Gunsch, Kai Christensen

Digital InterPlot
Travis Cork, Ryan Rykowski, Ranka Samardzic, Troy Zornjak

Axiom (Full License Users)

These users are responsible for making changes using Global File Changer and RefManager editing tools.

- Jon Collado, Travis Cork, Deb Fahlsing, Diane Gunsch, Stacey Hanson, Mike Johnson, Connie Schafer, Ardin Striefel, Wayne Zacher, Troy Zornjak

CADD Standards

1.3 CADD Committee

Oct 2008

Members: Ron Henke (chairperson), Brian Raschke, Diane Gunsch, DeLane Meier, Diane Laub, Jon Collado and Joyce Schmidt (secretary)

The CADD committee is responsible for ascertaining the NDDOT CADD situation as a whole and making appropriate recommendations. This committee is responsible for the following:

1. CADD hardware
2. CADD software
3. CADD Training
4. Oversee the Standards Committee

1.4 Standards Committee

Oct 2008

Members: Jon Collado (chairperson), Deb Fahlsing, Troy Zornjak, Matt Gangness, Diane Gunsch and Travis Cork

The Standards committee is responsible for developing, maintaining, documenting and providing training for the NDDOT CADD standards. The standards committee is not responsible for enforcing the standards. If a user has a problem or cannot use one of the standards, they should fill out the MicroStation / GEOPAK Standards Request form, SFN 51169.

CADD Standards

Project Administration

2.1 Project Directories

Oct 2008

The sharing of information is a vital part of the success of a NDDOT project. Thus, when a new project begins, a centralized directory structure is needed. Since it is important that data is shared but not corrupted by unauthorized users, the Department has established a standard procedure for directory creation and file naming.

Users should contact the “Help Desk” within the Information Technology Division if they need to set up a new project directory. Users should contact the “Help Desk” by email (-grp-dot Help Desk). The email request should include the project number. The Help Desk will setup the standard root directories on the central CADD server. NDDOT project numbers consist of a funding code, district, highway, agreement number, and mile point. A typical number may be: NH-8-013(031)389. The directory created for this project would be as follows:
r:\project\80013389.031.

Each directory has the appropriate security access set by division. Thus, Bridge staff is only allowed **write** access to the Bridge subdirectory. Other directories will be “read only” for Bridge staff. The directory under the r:\project\80013389.031 directory would consist of the following subdirectories:

As-built	(Assigned District or Construction Division)
Bridge	(Bridge Division)
Design	(Design. Urban, Rural and concept reports)
District	(Any of the 8 District offices)
Consultant	(Hired Consultant Firm)
Material	(Materials & Research Division)
ROW	(Right of Way Division)
Survey	(Surveys and Photogrammetry Section)
Traffic	(Traffic section. Signing, Roadway Markings etc.)
DIP	(Digital InterPlot)

Computer Services has optimized levels of security so that project related folders, up to and including the above root directories, cannot be deleted or edited. However, any folder can be created by an individual user, past that level. Obviously, users need to follow certain conventions of folder and file naming in order to effectively communicate with others.

Under each of these root directories, there are unique folders that describe the specialized operations of these users. For example, the users in Surveys and Photogrammetry would use the following directory when they are working on electronic field book data:
r:\project\80013389.031\survey\EFB.

CADD Standards

The following are recommended subdirectories:

As-built

- Sheets

Bridge

- (Subdirectories for each structure, name based on structure Number)

Consultant

- As-built
- Bridge
- Design
- Material
- ROW
- Survey
- Traffic

Design

- Environmental
- Blue_Tops
- Photos
- Sheets

District

- Sheets

Material

ROW

- Sheets

Survey

- Compilation
- Consultant
- EFB
- Photos_Scans

Traffic

- Sheets
- Photos

DIP

- Addendum
- Asbuilt
- Final
- Plan_Rev
- Preliminary
- PS_E

CADD Standards

The DIP (Digital InterPlot) Directory is used for Managing Plot Set Files. This directory is also used to manage Adobe PDF files. Under the DIP directory subfolders are used to organize plot sets created at particular phases of project development.

Project Development Phase	Directory Name
Preliminary Project Reviews Conducted before the PS&E	Preliminary
Comprehensive Review of Plans Specifications Estimates done approximately one month before the plan completion deadline.	PS_E
Original version of plans first posted on the internet	Final
After final plan completion and before the bid opening	Addendum
After the bid opening, often used with change orders	Plan_Rev

The Consultant directory is not automatically created. If consultants are involved on a project, The Technical Support person should contact the help desk to have the consultant folder added. Technical Support will have write access to all subfolders. Surveys and Photogrammetry will have write access to the “consultant\survey” subfolder.

Occasionally, some projects are not associated with a project number. The project may not be adjacent to a highway such as a wetland mitigation project. Miscellaneous projects that don't have standard project numbers should be stored in a subdirectory under R:\project\misc\. A brief project description could be used as the project subdirectory name. The sub directory structure will be set up the same as a normal project. Users should call the help desk to get a base subdirectory created.

Right of Way plots that are not associated with a highway project are stored in the “R:\project\PLATS_misc\” directory.

CADD Standards

Districts

Most users, including users in the NDDOT Districts, should be directly connected to the Central Office server. If you are a NDDOT District CADD user who's computer doesn't automatically connect to the Central Office server (map the r:\ drive), contact the Help Desk (328-4357).

Sometimes the speed of access across networks is not acceptable. If you are a District User that is experiencing network performance problems, do your work on a local server (usually the g:\ drive) and move your work to the Central Office server (r:\ drive) after it is completed. After the project information has been moved to the r drive it should be removed from the g drive. Be sure to set up and use a project directory structure that is similar to the Central Offices. Except for the drive letter designation, the directory and file path should be the same as the Central Offices (example: g:\project\80013389.031\district\).

Consultants

Consultants shall set up and use a directory structure similar to the Central Office.

1. Create a project folder using the NDDOT Standard directory structure. Consultants can revise the server or drive designation as they need (example: x:\NDDOT\project\80013389.031). Everything after the project number (example: 80013389.031) must be setup the same as the NDDOT standard project directory.
2. Do all work in this directory?
3. When a project is complete copy the files to a CD or DVD.
4. If an entire project has been completed for the NDDOT (including design details), the files should be sent to your respective Technical Support Contact within the Design Division.
5. If only the survey work is to be done by a consultant, the files should be sent to Surveys and Photogrammetry Section Leader.
6. Dependant on steps 4 and 5, the Technical Support Contact or the Survey and Photogrammetry Section Leader will import the project information to the r:\ drive and re-path reference files with Axiom Reference Manager.

All users, especially District and Consultant users, need to use the "Save Relative Path" options when referencing files. The "Save Relative Path" option will help keep the reference path integrity when the files are moved from one drive to another.

CADD Standards

2.2 File Naming Conventions

Oct 2008

MicroStation drawing names have been standardized for easy, quick and consistent identification and they have been standardized to ease the preparation of plan plot sets using “Digital InterPlot”. Standard names also apply to non-drawing files that are used in a plan plot set.

[Appendix A](#) lists the current standard drawing names. When you are about to create a new file, check the appendix to find the correct naming convention. Please contact the CADD Specialist or someone from the Digital InterPlot Support Group (see [Section 1.2](#)) if you need a file name that doesn’t fit the existing naming standards.

Standard drawing names can be made up from 4 parts; prefix, plot number, suffix and suffix modifier. The following drawing name is in accordance with the standards:

004SW_002_SCOPE.dgn

In this example the “prefix” is **004SW**, the “plot number” is **002**, and the “suffix” is **SCOPE**. Note the underscore characters are standard name dividers. They are used after the prefix, plot number and between the suffix and suffix modifier. The example standard name doesn’t use a “suffix modifier”.

The “prefix” is used to divide and organize plot sets into sections. The prefix is required for all drawings that are going to be **directly** incorporated into a plot set for plan production. These plots are used to directly print a sheet in the plans. The prefix should not be used for a referenced drawing that is **indirectly** included in the plans. For example, topog information include in the plans is **indirectly** included in the plans because it is a referenced drawing. The topog drawing should not have a prefix. The topog drawing would just be named TOPOG.dgn.

CADD Standards

The following table lists standard sheet name prefixes.

Section Number	Section Description	Sheet Name Prefix
001	Title Sheet	001TS
002	Table of Contents	002TB
004	Scope of Work	004SW
006	Notes	006NT
008	Quantities	008QS
010	Basis of Estimate	010BE
011	Data Tables (Concrete Pavement Repair Locations, Coring Data, Salvaged Base Summary, Earthwork Summary, Mass Diagram, Super Elevation Tables, etc)	011DT
020	General Details	020GD
030	Typical Sections	030TP
040	Removals	040RM
050	Inlet & Manhole Summary	050IM
055	Drainage Layouts (Separate Plan and Profile Sheets for Drainage Items, Use When PP Sheets too Crowded)	055DL
060	Plan & Profile	060PP
070	Contours	070CT
080	Layouts (Survey Data, Fencing, Super Elevation Layouts, etc.)	080LO
085	Landscaping	085LS
090	Paving Layouts	090PL
100	Work Zone Traffic Control	100WZ
110	Signing	110SN
120	Marking	120MK
130	Guardrail	130GR
140	Lighting	140LT
150	Signals	150SL
160	ITS	160IT
170	Bridges & Box Culverts	170BR
175	Soil Boring Logs	175SB
180	Pit Plats and Borrow Areas	180PT
190	Haul Road Restrictions	190HR
199	Tied Plans Not Contractually Requiring NDDOT CADD Standards	199TI
200	Cross Sections	200XS

Note, If Signing and Marking are on the same layout sheet use section 110-Signing

CADD Standards

Information that is included in sections 040 Removals, 055 Drainage Layouts, 080 Layouts, 085 Landscaping, and or 090 Paving Layouts can be included in section 060 Plan and Profile instead of segregating information in there respective drawings. If the plan and profiles don't have enough space to clearly communicate details, additional sections, such as 040, 055, 080, 085 and 90 should be used.

The "plot number" is used to organize drawings within a section (prefix) of the plans. When plot numbers are used, they should start out at 001 for each section and increment up through the end of the section. Plot numbers are used to organize sheets within a section. They are not intended to be the sole tool to organize all the sheets within a plan plot set.

For example plan and profile sheets could be organized so that mainline plan and profile sheets are before side street plan and profile sheets. A project may have 7 mainline plan and profile sheets and 4 side street plan and profile sheets. The mainline sheets could be numbered 001 through 007 and each specific side street sheet could be organized by the next plot number. The sheet that directly precedes the mainline plan and profile sheet would be numbered 008, the next sheet would be numbered 009 and so on. Note: the plot number should be named with three characters because Digital InterPlot sorts the names as text. Zeros should be used as place holders for plot numbers less than 100. The text "2" is after the text "002". The text "2" is also after the text "003".

Leading zeros should not be used in the sheet title block for section and page number.

Plot numbers are not needed for drawings that are not directly used for plan plot sets. They are optional for drawings that are directly used for a plan plot set if the full drawing name is sufficient to sort the names in the correct order. Example: a drawing that is the only drawing within the section would not need a plot number. A plan plot sets may not need a "plot number" for the "Scope of Work" sheet if it is the only sheet in the section. There are no other sheets within the "Scope of Work" section to organize.

The "suffix" part of the name is used to identify a sheet within a section by content. For example there are many different types of layout sheets. Most are in section 080. However users need a suffix to distinguish by name the Fencing Layout Sheets from the Survey Data Layout sheets. All drawings require the suffix part in their name. For drawings that are not directly included in a plan plot set (a referenced drawing), the suffix part of the name is the same as the name of the drawing. Example the drawing named TOPOG.dgn has a suffix that is the entire name.

Suffix modifiers may be added after the suffix to give additional distinction to a standard drawing name. Suffix modifiers are usually optional. They are only mandatory for as-builts. If used, they should be based on the information in the drawing. Users are to use their discretion when creating a suffix modifier. Example, construction sign layout sheets may have suffix modifiers to indicate the phase and location. The following drawing name is an acceptable standard name: 100WZ_012_CS_Phase1EighthSt.dgn. The suffix is CS and the suffix modifier is Phase1EighthSt. Suffix modifiers can be used with any drawing name.

CADD Standards

2.3 AAREADME File and Directory Cleaning

July 2007

The AAREADME file should be an ASCII text file that helps users find data within a project folder. Each folder within a project directory should have an AAREADME file in it. This file is simply a text file that describes the folder contents.

All AAREADME files should contain:

1. Directory being described
2. Project Number(s)
3. PCN Number
4. Brief Project Description
5. Drawings that do not use the standard naming convention should be listed in the AAREADME file. This list should also be submitted to a CADD Standards representative in order to correct any deficiency with the Standard Naming Convention.
6. List files that should not be archived. List or group files to be deleted after plan completion, like conceptual drawings.
7. If a project was abandoned or shelved, a history of what was designed should be detailed.

AAREADME files for the Survey folder should also contain:

8. County Name
9. File Index
 - a. File Name
 - b. Progress
 - c. Description
10. Journal (in paragraph format)

It might include a dated description of how the data was collected, where it came from, or what needs to be done in the future. Each entry should be dated and the author should attach their name to the information in case someone has questions.

AAREADME files for Design, Traffic and District folders used for design work should also contain:

11. Name of designers who worked on the files within the directory
12. Multiple gpk explanation (If multiple GPK files were used within one directory explain why.)
13. Provide a key for correlating alignments (chains and profiles) This key should describe what chains were used with what profiles
14. Explanation of Sub (children) directories.

CADD Standards

Example for a Survey Folder

R:\project\70002091.065\SURVEY\EFB>

NH-7-002(065)091

PCN 14794

Reconstruction, Palermo Section, Stanley, east 10 miles

Mountrail County

2dBdy.dgn

Complete EFB data and user information

Aareadme.txt

Complete this document

bdy91001.ind

Complete GPK input file for Hwy2

Efb-Top2

TEMP DEL Work file additional Topo data

Efb-Top3

TEMP DEL Work file additional Topo data

Efb-Bdy.dgn

In Progress EFB Bndry data; EFB data from January 2nd needs to be added.

Efb-Top.dgn

Complete EFB Topog data; includes side road extension at station 154+65 Left.

Job001.gpk

N/A Contains current alignment. EFB data from January 2nd will need to be added.

18 March '04 [J. Doe].... Tammy Doe e-mailed in five (5) .dat files, and an excel file with the observation of the station information. These data files are the GPS observations of the control points for the above said project. I sent these .dat files into the NGS OPUS processing center and received back the OPUS derived coordinates. The dat files and opus results (*.doc) documents can be found under

25 March '04 [E-mail from ABC engineering]

Good Morning John,

We have completed the first segment, project number PCN14794. There are several things to note. I changed the point numbers of the targets we discussed last week. Point numbers 312 and 313 had already been used for ... Tioga and heads east next week. Thanks for all your help.

Tim Smith, ABC Engineering
(701)555-1234

CADD Standards

Example for the Design, Traffic or District folders used for design

R:\project\30002269.065\D_URBAN

CMU-3-002(065)269

PCN 12345

Hwy 2 through the City of Devils Lake – Reconstruction

Files that should not be archived

All of the files in the “design\temp” folder should be deleted after final plans have been submitted.

Designers

John Doe

Mary Jane

GPK – 001 was used by Design in the Central Office. GPK -002 was used by a consultant for the tied city project (9th Street)

ALIGNMENTS KEY

<u>HORIZ</u>	<u>EXIST-V</u>	<u>PROP-V</u>	<u>ROADWAY</u>
BASE01			N-S SECTION LINE (NEW STA - S TO N)
BASE64			N-S SECTION LINE (OLD STA - N TO S)
PROP01	EXSR01	VER01	WEST SR 34TH AVE END PROJECT 119+00
PROP02	EXML02	VER02	WEST MAINLINE ROADWAY
PROP03	EXML03	VER03	EAST MAINLINE ROADWAY
PROP04	EXSR04	VER04	EAST SR 36TH AVE TO 32ND AVE
PROP05	EXSR05	VER05	EAST SR 32ND AVE TO END PROJECT 119+00

Sub (children) directories

The “sheet” directory was used for plan cut sheets. The “details” directory was used for plan details.

CADD Standards

Directory Cleaning

CADD Files should be cleaned (organized and purged) regularly during project development. Some CADD files should also be purged after the following milestones:

1. Final Plans Have Been Submitted
2. Final Construction Records Have Been Completed (including as-built drawings)
3. Three Years After Project Completion – Final Construction Records Have Been Completed.

Preliminary files that were only used for conceptual planning, like environmental documents, should be kept through the design phase. The main environmental document should be stored on FileNet. However, most conceptual planning documents on the r: drive should be purged after the **Final Plans Have Been Submitted** for construction.

Microsoft Word and other word processing documents should also be purged after the **Final Plans Have Been Submitted** for construction. Only documents that directly support the plans, like plan notes, should be archived in the project directory. Other documents such as correspondence and reports should be in FileNet or Central File. These documents should not be archived with the project directory.

The only conceptual drawings that should be kept after the final plans have been submitted are drawings that were displayed at a public meeting. Drawings displayed at public meetings should be kept until **Three Years After Project Completion** and then discarded. Drawings displayed at public meetings should be grouped in a project sub directory for easy identification and protection (example r:\project\30002269.080\DESIGN\Public Hearing\). Remember that drawings displayed at public meetings should not be edited after the meeting. You must keep an unedited version of the drawings (including reference files). All files stored in a directory named like “Public Meeting”, “Public Input”, “Public Hearing” or “Public Information” will be deleted three years after the project is completed.

After the **Final Plans Have Been Submitted**, the only files that should be in the design folder are files that directly support the final plans. Temporary files and files detailing alternates that were not advanced should be deleted after the final plans have been submitted. Alternates or options advanced as part of the plans (bidding options like a steel bridge vs. a concrete bridge) should be archived.

Consultants submitting final plans should clean the project directory before the electronic files for final plan submittal are packaged and delivered to the NDDOT.

CADD Standards

After the construction records have been completed (at the time the project is moved near-line) some supporting project files may be deleted from the project by the Information Technology Division. The following list of files that will be deleted at this time.

*.x, *.rx	GEOPAK Criteria Files
*.inp	Input files used mostly for GEOPAK
*.jou	GEOPAK journals
*.bak	Backup files
Projdb Directory	GEOPAK Project Manager directory
*.ind	User input files used for GEOPAK
.lis,.btb *.rtb	Files used for blue top books – slope stakes
*.ond	User cogo output files used for GEOPAK
*.log	Log files
*.cel	Project cell libraries

CADD Standards

2.4 Standards Directory

Oct 2008

Here is a summary of the “NDDOT Standards Directory”. Files stored in this directory are used to configure many of the operations performed in MicroStation, GEOPAK, and InterPlot. More extensive descriptions of their functions are contained in the [Section 2.5](#).

Description	Directory
Axiom Support Files	S:\STANDARD\ XM \ AXIOM
Bentley View Setting Files	S:\STANDARD\ BENTLEYVIEW
Cell Libraries	S:\STANDARD\ XM\ CELL
MicroStation "Groups" - Select Settings	S:\STANDARD\ XM \ DATA\STG
Spell checker Dictionaries	S:\STANDARD\ XM \ DATA\Dictionaries
Border Sheet Tags	S:\STANDARD\ XM \ DATA\TAGS
DGN Libraries	S:\STANDARD\ XM \ DGNLIB
Configuration, Preference Files	S:\STANDARD\ XM \ INSTALL
Interface Files	S:\STANDARD\ XM \ INTERFACE
InterPlot Support Files	S:\STANDARD\ XM \ IPLOT
MicroStation Macros	S:\STANDARD\ XM \ MACRO
Central Office Plot Drivers	S:\STANDARD\ XM \ PLOTDRV
Seed Files	S:\STANDARD\ XM \ SEED
line styles, fonts, color table	S:\STANDARD\ XM \ SYMB
Visual Basic	S:\STANDARD\ XM \ VBA
GEOPAK Criteria Files	S:\STANDARD\ XM \GEOPAK\ CRITERIA
GEOPAK D&C Manager	S:\STANDARD\ XM \GEOPAK\ DCMAN
GEOPAK Drainage Files	S:\STANDARD\ XM \GEOPAK\ DRAINAGE
GEOPAK Sheet Files	S:\STANDARD\ XM \GEOPAK\ SHEETS
GEOPAK Super Elevation Files	S:\STANDARD\ XM \GEOPAK\ SUPERELEVATION
GEOPAK Survey Support Files	S:\STANDARD\ XM \GEOPAK\ SURVEY

CADD Standards

2.5 Configuration Settings, Preference Settings, and User Interface

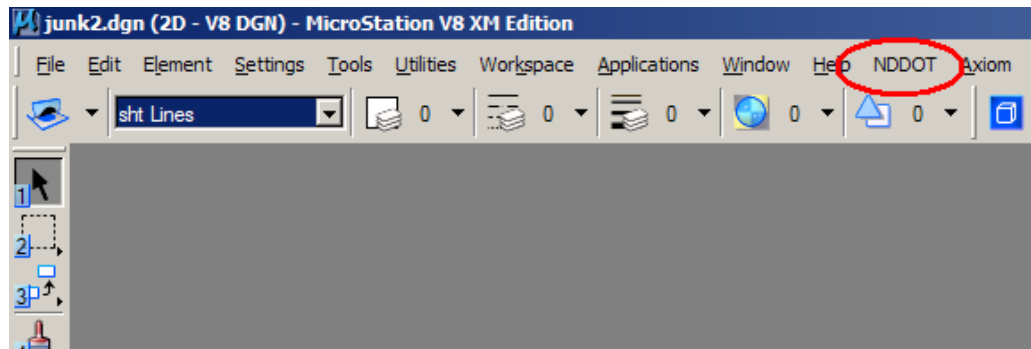
Feb 2009

Having the correct settings is required to use the NDDOT standards properly. Details of some of these settings will be discussed shortly. But for many users, the following summary will suffice.

For most NDDOT users, the standard configuration, preference and setting files should be correctly set up by support staff. Most of the CADD standard files are linked to the s:\ drive. Typically if one standard setting is set up correctly, they all will be correctly set.

Most users can typically tell if their computer is set up correctly by doing the following:

1. Open MicroStation



2. The main menu should have a “NDDOT” pull down menu. If you can see this, everything is probably installed correctly.

Default Directories

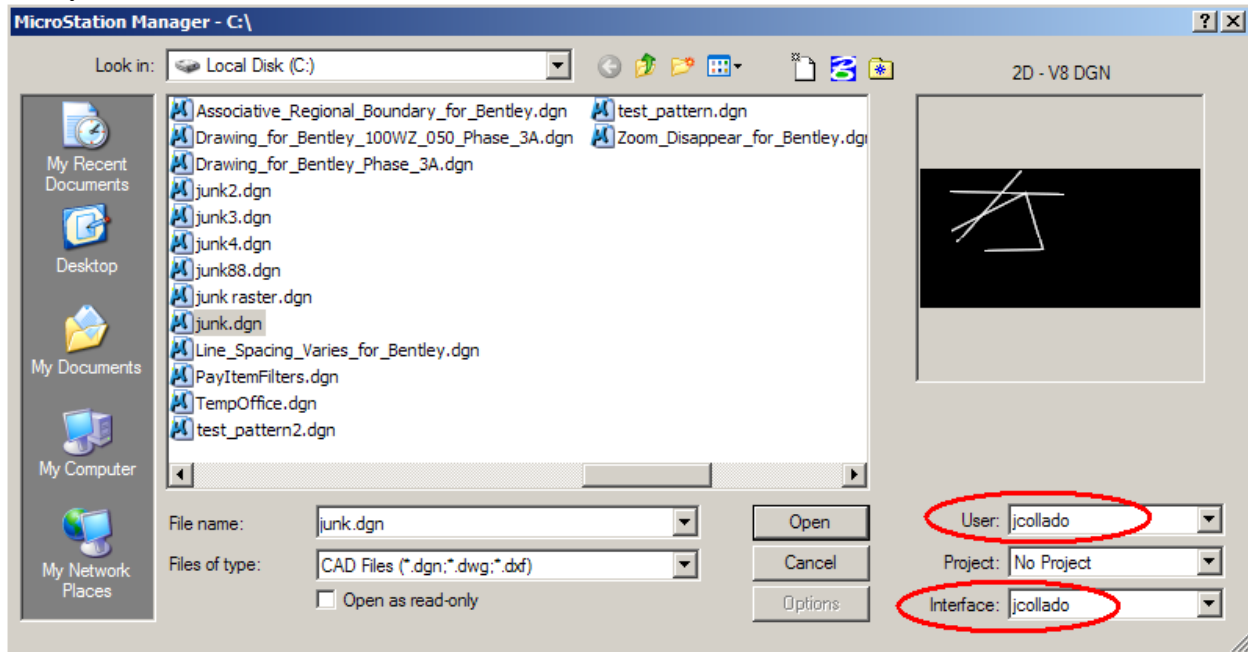
Most user workspace files have been moved to “C:\NDDOT_CADD\s_drive\Support\users”. A subdirectory named after your user name should have been created under this directory. In this explanation “jcollado” is used. But, everyone will have their own unique name. CADD standards have been created to help you leverage this directory without having to adjust configuration files.

The directory “c:\NDDOT_CADD\” has been structured the way it is for a couple reasons:

1. Modified local CADD files are grouped together for easier management.
2. Files are grouped for easier portability. MicroStation-Geopak, NDDOT CADD Standards and project information can be used locally, such as on a laptop –that is disconnected from the network. See NDDOT CADD Standards for “Taking Electronic Drawings into the Field”.
3. Files are grouped the way they are to copy some of Bentley’s default paths.
4. Files are grouped the way they are to enable networked workspaces. A very small group of users keep workspace settings under “s:\Support\Users\”. Guidance for these users is not discussed in this reference.

CADD Standards

Your default user name and interface should be setup for you. These settings should be named after your user ID.



Note, when you log on to your computer (log on to windows) use lower case. The text case isn't important for Windows but it is important for MicroStation (example, "jcollado" is not the same as "Jcollado").

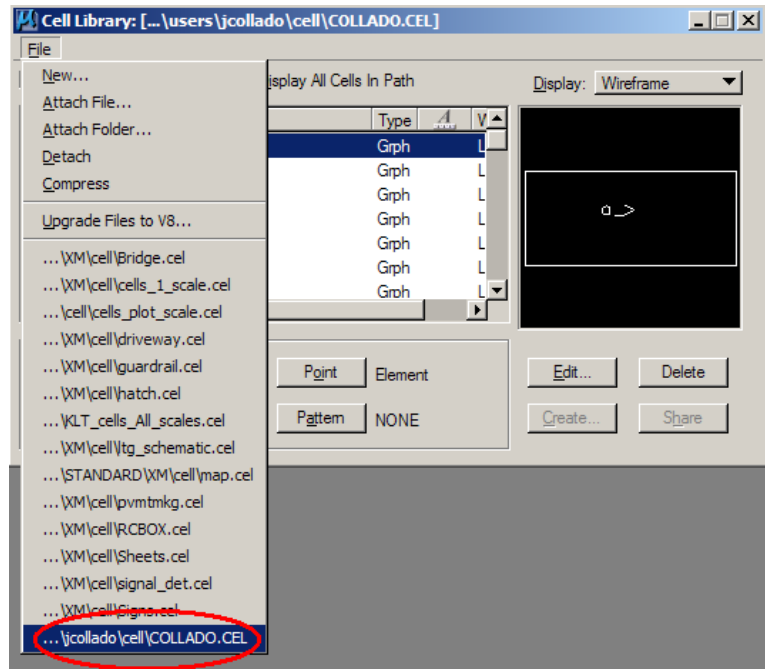
User Configuration Files

Your user configuration file is named after your user id and is stored in the "user" sub directory (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\Users\jcollado.ucf). Note, a user may have more than one set of user configurations. Example, a user may have another configuration file for the "Image Viewer" Application (C:\NDDOT_CADD\s_drive\Support\users\jcollado\Users\iv.ucf).

CADD Standards

Cells

If you put personal cell libraries in the cell directory (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\cell), they will automatically be added to your cell list. You should not have to search for your personal cell libraries.



Interfaces (Menus and Tools)

If you create a dgnlib for custom menus and tools for personal use, it should be stored in your interface directory for MicroStation under the appropriate user subdirectory (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\Interfaces\MicroStation\jcollado\jcollado.dgnlib). Changes will be appended to the Standards Interface.

Function Keys

If you create custom function keys, you should save your changes to the Fkey subdirectory and name the file after your user ID (Example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\Interfaces\Fkeys\jcollado.mnu) This file must be named using your user ID in order for it to be attached without editing configuration files.

Accudraw Shortcut Keys

If you edit Accudraw shortcut keys, you should save your changes to the Fkey subdirectory and name the file after your user ID and the appended “_shortcut.txt” (Example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\Interfaces\Fkeys\jcollado_shortcut.txt). This file must be named using your user ID and the appended “_shortcut.txt” in order for it to be attached without editing configuration files.

CADD Standards

Macros

MicroStation Basic

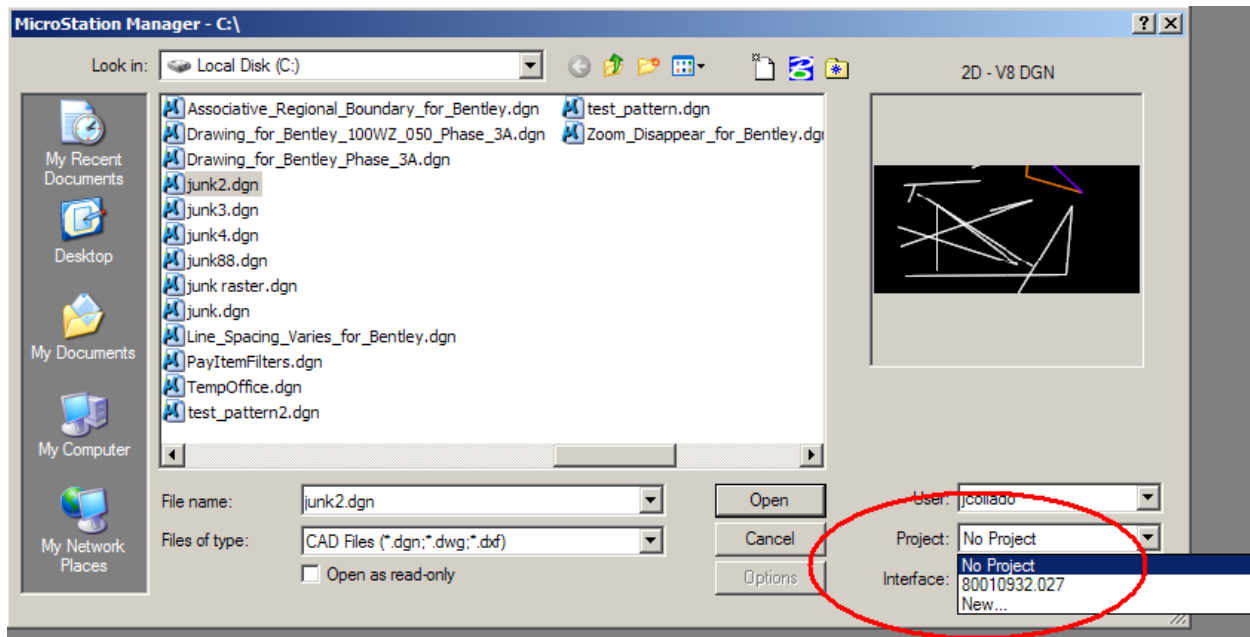
If you create personal Macros, you should save them to the Macro Folder (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\macros\jdc_test.bas). If the macros are stored in this directory, you will not have to browse for them.

VBA

If you create personal VBA, you should save them to the VBA Folder (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\macros\jdc_test.mvba). This is the first place MicroStation will look for your macros.

Projects (MicroStation Shortcuts)

Does browsing the R drive for your project annoy you? Do you want to see shortcuts for only your projects? If yes, using a project configuration file may be the answer for you. Simple project configuration files can be copied from S:\STANDARD\PCF\Test. Find the one for your respective project and copy it to your projects subdirectory (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\Projects\80010932.027.pcf). If you have a pcf file in this directory, your respective team list will be replaced with your personal list in the MicroStation Manager dialog box. Setting the “Project” in this dialog box will automatically point to your project subdirectory.



If a project configuration file (pcf) has not been set up for your project – file is not in S:\STANDARD\PCF\Test, contact the CADD support specialist.

CADD Standards

Site Configuration Files

Most users don't need to understand how Site Configuration files work. This section is primarily for Consultants and other users that have to set up their own site – office.

Presently the NDDOT uses a site configuration file to point to most of the CADD Standard resource files. For NDDOT users, the site configuration file is located at

s:\standard\XM\NDDOT_XM.cfg.

This file can be opened and reviewed with a simple text editor application such as notepad.

The typical installation of Bentley software is used with one exception. The parent Bentley folder name is changed to “C:\Program Files\BentleyXM\” (XM is appended to the word “Bentley”). This change helps facilitate loading different versions of Bentley software on one computer.

During a typical NDDOT computer setup the following file added:

C:\Program Files\BentleyXM\MicroStation\config\appl\NDDOT_Pointer.cfg

There is a variable in this file that changes the site standards.

_USTN_SITE = S:/STANDARD/XM/

Presently, no CADD standards are stored in user configuration files. The NDDOT sets up an empty user configuration files named after the users log on name.

Copying preference files from one computer to another has been discouraged. Preference files should be created directly from the MicroStation software. See preferences discussion below.

NDDOT user work space files have been moved to “C:\NDDOT_CADD\s_drive\Support\users” and are stored in a directory named after the user Windows log on name (example C:\NDDOT_CADD\s_drive\Support\users\jcollado). This standard workspace area helps automate many user processes.

Batch files were created to automate the creation of the standard user workspace. These files are located at “**S:\Standard\XM\Install**”

The NDDOT uses a standard interface. For NDDOT users the interface file is accessed directly from the following location;

S:/STANDARD/XM/Interface/Interface_Date-Version.dgnlib

The NDDOT configuration and interface files can be copied from the NDDOT CADD web site. www.dot.nd.gov/manuals/design/caddmanual/caddmanual-v8.htm.

CADD Standards

Application Configuration Files

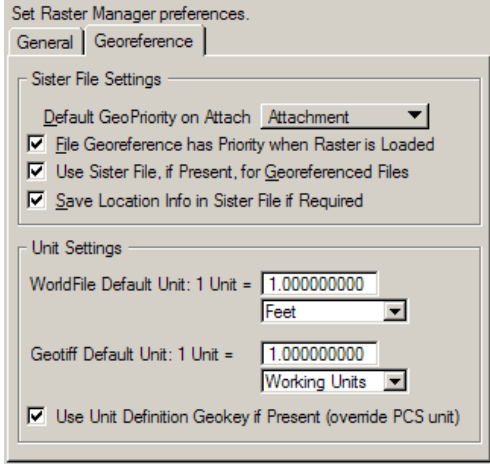
Configuration files located in **C:\Program Files\BentleyXM\MicroStation\config\appl** are automatically loaded by MicroStation. These files are for applications such as GEOPAK and Axiom.

CADD Standards

Preferences

Your user preference file is named after your user id and is stored in the “pref” subdirectory (example, C:\NDDOT_CADD\s_drive\Support\users\jcollado\Home\prefs\jcollado.upf).

The following table lists some preference settings that are not set with the original MicroStation Installation. These settings are recommended for the general user. Most of the preferences are stored in the user preference file (upf). Make the following changes in your user preferences by selecting “workspace > preferences”.

Preference Name	Description	Setting
Input>Allow ESC key to stop current command	When the ESC key is selected, the current command is stopped and the default command is started.	enabled
Raster Manager > Default Raster Attributes	Default level that rasters are attached to	Level = Raster Group 1
Raster Manager > Georeference (tab) > (as shown)	These are some settings needed for working with TerraShare pictures	
Reference > Set Default Attachment Preferences > Display Raster References	When references are attached, they can also automatically at the rasters that are attached to the reference.	Disable
Task Navigation > Presentation	Adds tasks name to tools	Dialog
Task Navigation > Icon Size	Makes dialog smaller, recommend for verbose task navigation	Small (16 x 16)

CADD Standards

Some preferences are stored in the preference file (upf) but are not changed through “workspace > preferences”. The following table lists some NDDOT preference settings that are different than the MicroStation default settings, but not edited in the preference dialog box.

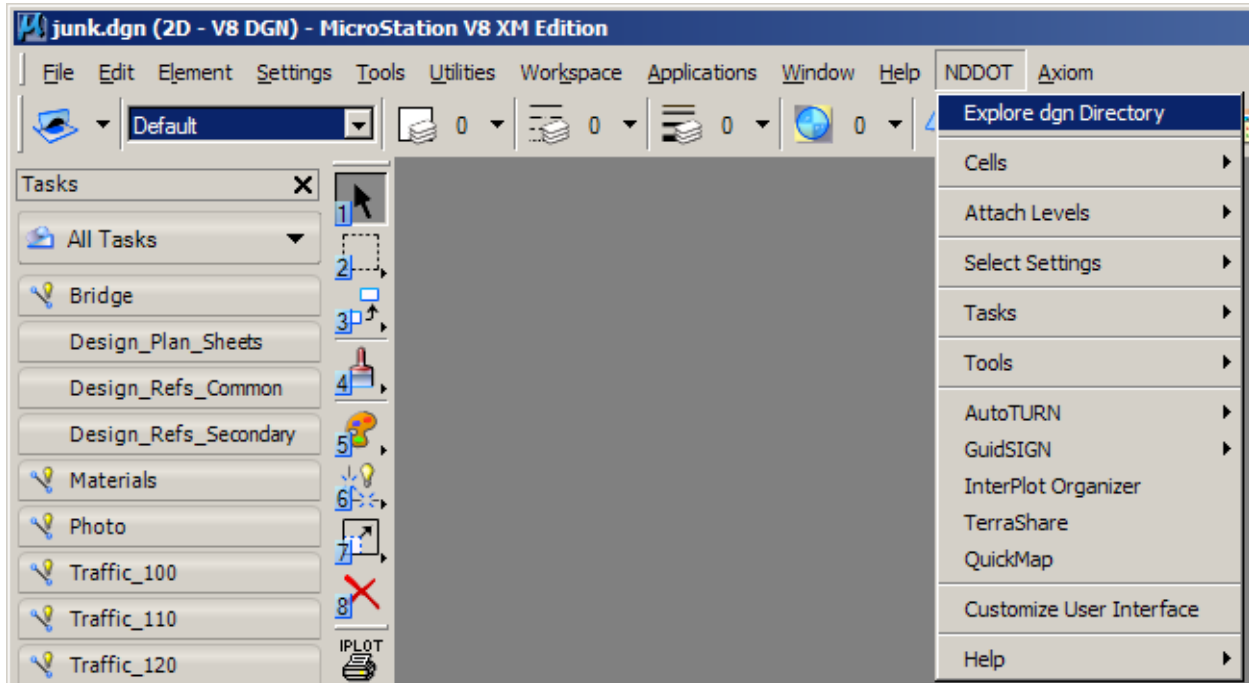
Preference Name	Description	Setting
File > Compress > Options	Allow deletion of unused – empty parts of the dgn file	All settings enabled
Settings>Snaps>AccuSnap>Enable For Fence Create	Allows AccuSnap while placing a fence.	enable
Within the Place text command - “Apply changes to all text”	Allows multiple formats within one text element	disabled
Button Assignments	The NDDOT no longer has its own default setting.	Not edited by default – use Bentleys defaults
Within MicroStation Print Dialog Box – “Settings>Preferences>Allow Paper Size Editing	This setting is needed to create custom plot sizes from roll plotters	enable

If you are using Digital InterPlot, several additional configuration files should be loaded on your computer. The standard DIP Configuration files are located at **S:\STANDARD\XM\Install\bin\Iplot**. These files should be installed in the following locations:

Standard DIP Configuration Files
C:\Program Files\Common Files\InterPlot\IPLLOT\config\ ipplot.cfg
C:\Program Files\Common Files\InterPlot\IPLLOT\config\ iplotsrv.cfg
C:\Program Files\ProjectWise InterPlot Organizer\config\ ip.cfg

CADD Standards

NDDOT Main Menu



NDDOT changes to the MicroStation menu can be found in one pull down called NDDOT.

Explore DGN Directory

This tool is used to quickly open your drawing directory with Windows Explorer. It's a quick way to get to resource files related to your drawing.

Cells

Cell shortcuts are quick ways of opening common standards cell libraries.

Attach Levels

These tools will attach additional level libraries.

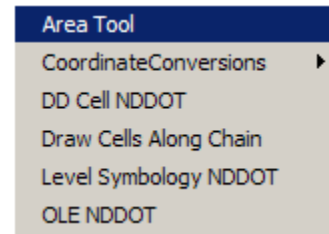
Select Settings

Under the pull outs; Bridge, Design, Materials, Photo, and Traffic, are shortcuts to launch NDDOT standard "Select Settings – Groups".

CADD Standards

Tools (NDDOT)

Additional tools adopted or created by the NDDOT can be quickly accessed from this pull out.



Area Tool

This is an advanced measuring and labeling tool. Not loaded with MicroStation by Default.

Coordinate Conversions

Caution is recommended with these tools. Don't use these tools unless you have received the applicable training.

DD Cell NDDOT

This is a quick way of loading ddcell mdl and launching the NDDOT tool box for dimension driven cells.

Draw Cells Along Chain

This is a great tool to place cells along a roadway alignment, such as placing delineators for work zone traffic control. Some GEOPAK knowledge is required.

Level Symbology NDDOT

This tool is used for some typical level symbology overrides.

OLE NDDOT

These tools can be used to expedite some "Object Linking and Embedding" processes. Applicable training is probably required.

Other Applications

Short cuts have been created to quickly turn on and off CADD related Applications such as AutoTurn, GuidSign and Terrashare. Note these applications will not work if they are not installed on your computer.

Help

This pull out contains shortcuts to common help references.

CADD Standards

2.6 Metric Support

October 2005

Presently the NDDOT is not using metric measurements for plan preparation work. At this time, NDDOT doesn't have standards created specifically for metric use. However, many of the English Standards could easily be adjusted for metric use. If you need to use metric settings for NDDOT work, contact CADD Support (see [Section 1.2](#)).

2.7 CADD Standard Revisions (When to Use Old Standards).

Oct 2008

CADD Standards often change while users are in the middle of a project. Productivity may be increased by switching to the new standard. However, continuing to use the previous standards may be more convenient. The previous or old CADD Standards can be used if all of the following occur:

1. The active project is presently incorporating the previous CADD standard.
2. Productivity, project uniformity, and/or plan readability are diminished by switching to the new standard.
3. The previous or old CADD standard is not considered a primary standard. Certain CADD Standards revisions must be implemented immediately. The following is a list of primary standards in which the most current version must be used:
 - a. Title sheet changes.
 - b. Standards needed to implement NDDOT software changes (example: GEOPAK V8.9)

When a new project is started the most current version of the CADD standards are to be used.

Example: The file naming standard for alignment drawings changed January 10, 2001. Alignment drawings were previously named align.dgn, but now they are named ds_align.dgn. If an active project already contained an alignment drawing named align.dgn, and this file was referenced in several other drawings, changing the name of the alignment drawing to ds_align.dgn may take several minutes to fully implement. In this case the user may elect to keep the old file name through the completion of the project.

CADD Standards

2.8 Taking Electronic Drawings into the Field

Oct 2008

This section discusses using CADD in the field. Field computers are not typically connected to the network (CADD Servers). Several important resource files are stored on the network and if computers can not find these resources they will not operate correctly. Some reference and raster files use a specific (full) path. These reference and raster files may not be properly attached when they are moved off the network (“R” drive). The following procedure discusses a method of copying and mapping resource files to a computer that is not networked or will not be networked when CADD tools and files are needed.

This procedure involves:

1. Copying the resource files to “C” drive. These files must be stored in a specific location.
2. Copying the needed project drawings and files to “C” drive. These files must be stored in a specific location.
3. Learning to use the appropriate icon - shortcut. This shortcut maps the resource files and project files in a manor that is similar to the way the files are mapped on the network. The shortcut creates a local “S” and “R” drive.
4. Updating resource files and project files as needed (as they change).

Note this procedure does not cover installing MicroStation and GEOPAK or checking out licenses. A Work Management System request is required for installing MicroStation and GEOPAK.

Step 1 can be accomplished by running a batch file or manually. Running the batch file is the preferred method. However, the computer must temporarily be connected to the network (“S” drive). After the computer is connected to the network, double click on the batch file **S:\STANDARD\XM\Install\CopyStandardsLocal.bat**. This file will copy the needed files locally (on the computers hard drive) to the directory “C:\NDDOT_CADD\s_drive\STANDARD”.

Step 2 involves copying the project files needed for field work. CADD project files are stored on the “R” drive. Files should be copied from “R:\project*.*” to “C:\NDDOT_CADD\r_drive\project*.*”. Similar - relative paths should be used when files are copied. Example: if the file R:\project\10083088.059\Design\Design.dgn is going to be taken into the field, it should be copied to C:\NDDOT_CADD\r_drive\project\10083088.059\Design\Design.dgn.

CADD Standards

Step 3 uses a customized desktop icon to temporarily create “S” and or “R” drives on your computer and start MicroStation. Caution, local “S” and or “R” drives can not be created if networked “S” and or “R” drives are already connected. Make sure your computer is disconnected from the network before proceeding with step 3. The icon - batch file runs a “Command Prompt” script, typically in a black dialog box. A new path “S:\” will be created. The files in C:\NDDOT_CADD\s_drive and S:\ will be the exact same files. They will just have different paths. The local “R” drive will have a similar relation to C:\NDDOT_CADD\r_drive.

Step 3 is to remember to update the standard resource files on “C” drive as needed. This should be done at least seasonally. To do this, just repeat step 1. Project files should also be updated on the “R” drive as required. The “R” drive is the official location to save project CADD files.

CADD Standards

2.9 Final Plan Delivery

Feb 2009

The “Final Plan Delivery” includes several products. The requirements below elaborate on some of these products including Production Drawings, Resource Files, Static Electronic Drawings and Paper Printed Drawings. Additional requirements are also listed in the “Scope of Work for Consultants Performing Preliminary Highway Surveys” and in other areas of the Design Manual.

1. Production Drawings – These files are typically native MicroStation Drawings (dgn). They are typically editable and contain more information than Static Electronic Drawings. Information can be queried from the drawing (example; where are the 96 inch manholes). Functional Electronic Drawings usually have working relationships with other drawings and several display options.

Production Drawings are required on projects under a direct contract with the NDDOT.

2. Resource Files - These files are not directly used in the plans but can be used to help build a project. Most are not directly printable. Examples of functional files include: Alignments files (gpk, dc), point files (asc, csv), and surface models (dtm, tin, dc). Several types of Functional Resource Files can be imported directly into survey equipment.

Resource Files are required on projects under a direct contract with the NDDOT and that require substantial earthwork. Projects that don't involve earthwork (grading) will not require resource files to be delivered with the plans.

3. Static Electronic Drawings – These files are usually more user friendly than Production Drawings. They are easy to review, transport, and print. The only approved “static electronic drawing” is a pdf (portable document format). Submittal of other static electronic drawings such as tif, jpg, and pps (portable plan sets) will only be accepted if these formats are pre-approved by the NDDOT.

Static Electronic Drawings – PDF's are required on all projects.

4. Printed Paper Drawings - This document is the original PE stamped and sealed document. Printed Paper Drawings are always required.

The “Final Plan Delivery” CD or DVD shall not include copies of the correspondence documents and preliminary reports. If the NDDOT Technical Support Contact person requests additional copies of the correspondence documents and preliminary reports, this information should be sent on a separate CD or DVD.

CADD Standards

Production Files Requirements

Production drawings shall follow the NDDOT CADD Standards. They shall be developed with MicroStation XM.

Conceptual production (dgn) drawings should be delivered when the project is being developed by a consultant that is only responsible for developing the environmental document. If the same consultant is responsible for developing the final plans, most conceptual production (dgn) drawings should not be submitted. Drawings that are displayed for the public (environmental documents, public input meetings and hearings) are exceptions to this rule. Drawings that are displayed for the public must be reproducible as shown to the public. Note static (pdf) files are the preferred method of displaying information for the public. If static (pdf) files of information displayed for the public are created and saved, the conceptual production (dgn) files do not need to be saved. Production (dgn) drawings can be displayed for the public, but all the drawings including reference files must be protected from further editing including display options. A version of the main drawings displayed for the public and all reference files must be copied and saved to a protected directory as read only. The protected directory should be named so that it is easily identifiable such as “Public Meeting”, “Public Input”, “Public Hearing” or “Public Informational”.

Production drawings shall only include files required for the development of the final plans. All of the conceptual drawings are seldom desired (see above paragraph). The Production files shall only include the essential (CADD Standard) files. Temporary, junk, alternative drawings not used in the final plans, backups, and other interim drawings shall not be submitted. The goal is to make it easy to review the project files and avoid the transmittal and storage of unnecessary files.

Drawing display setting (levels, reference files, view attributes and other rendering settings) shall be set and saved as they were used to create the final printed plans. The goal is to make it easy to review and print files. The reviewer should not have to figure out what reference files need to be turned on and what display settings need to be used.

Consultants should use the directory structure discussed in [section 2.1](#) and they should use the “Save Relative Path” when referencing drawings. The goal is to make project files portable. Broken reference paths are CADD standards violations (see [section 3.12](#) of the NDDOT CADD Standards Manual).

Production drawings should be set to read only before the plans are signed and stamped as required by the Board of Professional Engineers and Land Surveyors. The goal is to use the file modify date to flag and eliminate changes to the plans after they have been signed.

CADD Standards

Resource File Requirements

If shapes were used in the development of cross sections, drawings of GEOPAK super elevation shapes need to be submitted.

If cross sections are required, a working cross section drawing (includes XS origin cells) shall be submitted.

If earth work is calculated from cross sections, the earthwork shapes shall be drawn into the cross sections with stratified colors. The final earthwork shapes shall be kept so that they can be compared with the earthwork log file.

Multiple gpk files for the same phase of project development shall be avoided. Different coordinate geometry elements with the same name shall be avoided during plan development. Different coordinate geometry elements with the same name shall be prohibited when Resource Files are submitted as part of the plan delivery. Minimizing the number of gpk files will minimize the chance of coordinate geometry discrepancies.

CADD Standards

Static Electronic Drawing Requirements

Portable Document Format (pdf) is an accepted static electronic format.

The paper size format for the pdf must match requirements for paper delivery (example, plan sheet intended to be printed on 11x17 inch paper should be formatted to be printed on 11x17 inch paper). PDF's should be created at 600 dpi. Supplemental images - Rasters may be printed at a lower resolution but aerial photos shall not be used (see aerial photo exclusion below).

The overall electronic files size of the PDF plans is a concern. The plans must be easy to download.

1. The plans shall be divided and published in separate volumes.
 - a. Every separate volume shall be less than 40 MB. The individual sections, as defined by section numbers, shall not be split between volumes. The volumes may be split where the section numbers change. Designers shall use their discretion when deciding where the splits occur.
 - b. Cross Sections are always published as a separate volume(s).
 - c. The separate volume requirements only apply to the Final Plans, black and white plan set used for Electronic Distribution. Separate volumes are not required for other phases of project development, color or the PE version (used only for printing as sealing by a Profession Engineer or Surveyor).
2. Aerial photos shall not be used on any project to be constructed in 2009.
3. The PDF shall be optimized with Adobe Professional 9. The "PDF Optimizer" tool usually reduces the file sizes. The following is an overview of the Optimizer Settings.

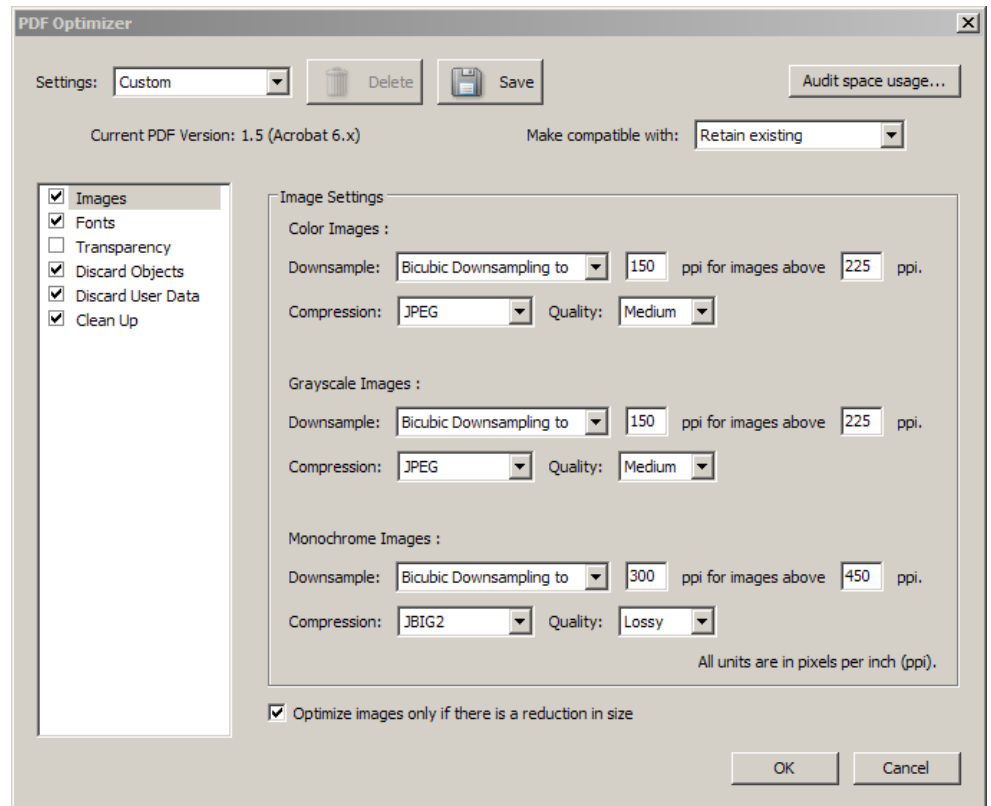
The "PDF Optimizer" tool is found in the Adobe Acrobat Pro menu under "Advanced> PDF Optimizer". Optimizing a file can take several minutes. Copy the pdf to a local drive before using the "PDF Optimizer" tool in order to improve performance.

CADD Standards

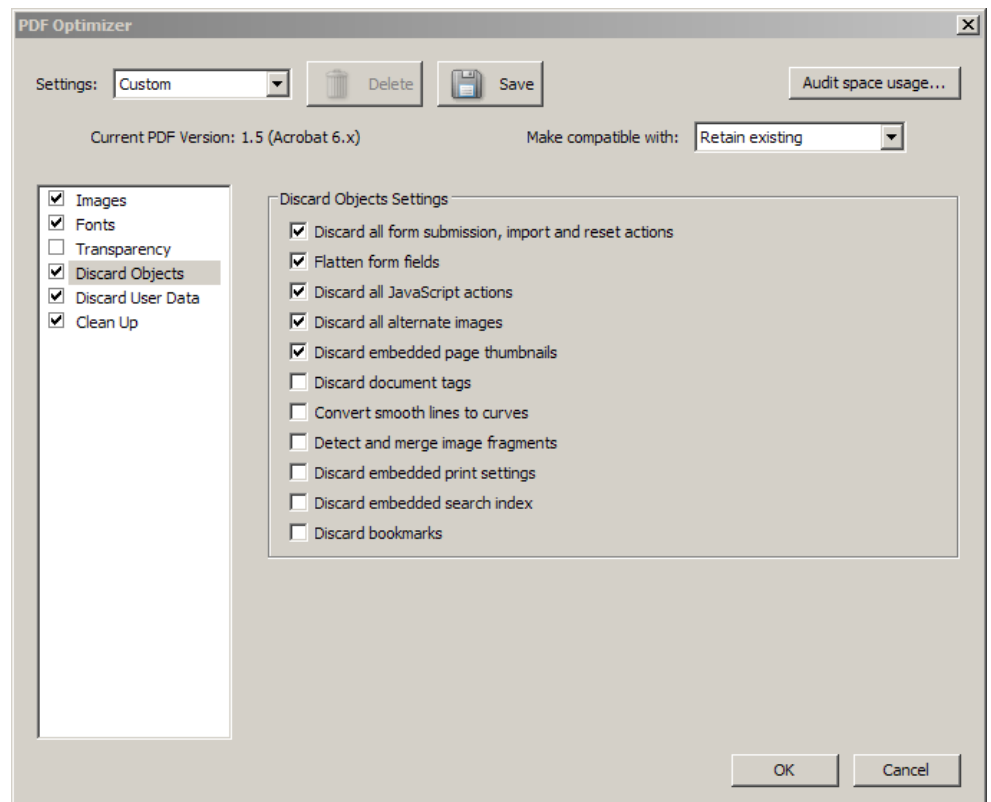
The standard-default “Images” settings should be used.

In the Fonts category, “Do not unembed any font”. **Fonts must be embedded within the PDF.**

Transparency settings have not been incorporated into the CADD Standards. Optimization settings for “Transparency” aren’t enabled.

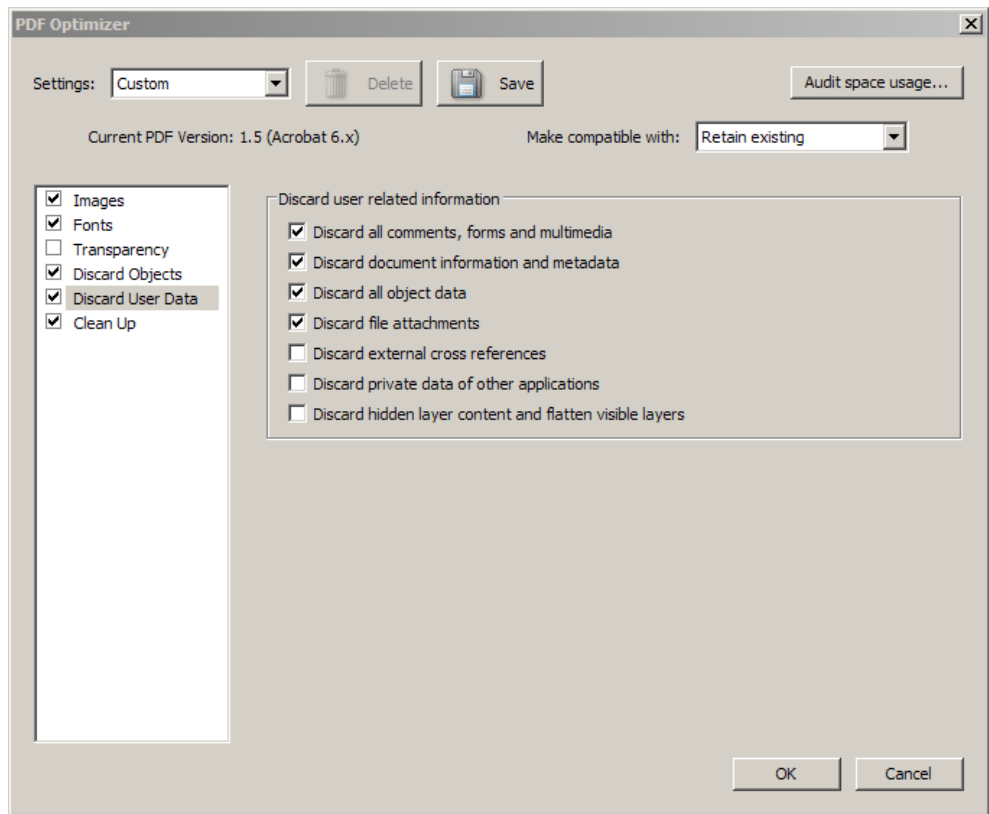


Discard Object Settings are as shown.

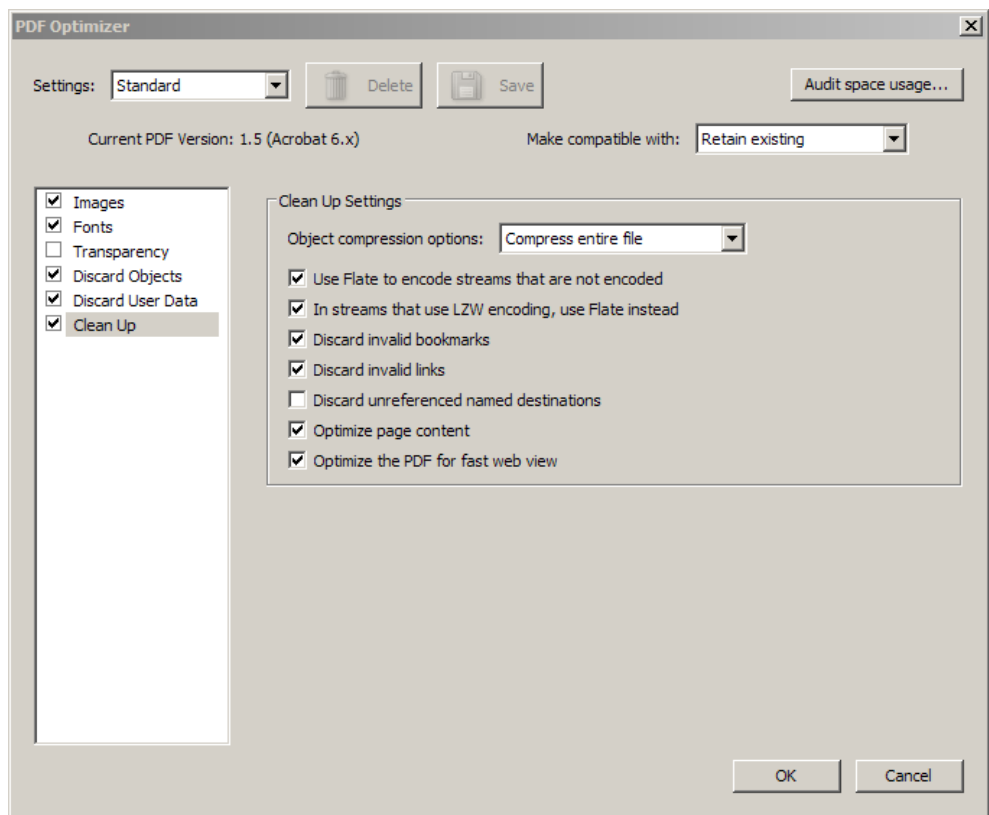


CADD Standards

Discard User Data
Settings are as shown.



The standard-default
“Clean Up” settings
should be used.



CADD Standards

The pdf plan set files must be named according to a standard naming convention. PDF files should be named by concatenating the following information:

1. "Project Number"
2. If the project requires cross sections, they must be included as a segregated file. A separate file must be used even if there is only one cross section sheet. The file name for cross sections shall include the abbreviation "XSEC".
3. Project phase such as
 - a. "Preliminary"
 - b. "PS&E"
 - c. "Final_Plans"
 - d. "Addendum1", "Addendum2", ... etc
 - e. "Plan-Rev1", "Plan-Rev2", ... etc
 - f. "Asbuilt"
4. The specific volume number and total number of volumes shall be included in the file names (example "1of3"). Every volume shall be counted, including cross sections and standard drawings. The volume suffix is only required for final plans used for bidding purposes. The use of separate volumes is optional for other phases of project development.
5. "Color" if the plan set is in color. All other sets will be assumed "black and white".
6. "ED" (for electronic distribution) or "PE" (for Profession Engineer signing and stamping).

CADD Standards

The under bar character “_” should be used between all the information linked in the name. The following is a list of example names.

IM-2-094(070)275_Preliminary
IM-2-094(070)275_Preliminary_Color
IM-2-094(070)275_PS&E
IM-2-094(070)275_PS&E_Color
IM-2-094(070)275_Final_Plans_#of#_ED
(replace # with actual numbers, example 1of3)
IM-2-094(070)275_Final_Plans_PE
IM-2-094(070)275_Final_Plans_Color_ED *

IM-2-094(070)275_Final_Plans_Color_PE *

IM-2-094(070)275_Addendum1_ED
IM-2-094(070)275_Addendum1_PE
IM-2-094(070)275_Plan-Rev1_ED
IM-2-094(070)275_Plan-Rev1_PE
IM-2-094(070)275_Plan-Rev2_ED
IM-2-094(070)275_Plan-Rev2_PE
IM-2-094(070)275_Asbuilt
IM-2-094(070)275_Asbuilt_Color

IM-2-094(070)275_XSEC_Preliminary
IM-2-094(070)275_XSEC_Preliminary_Color
IM-2-094(070)275_XSEC_PS&E
IM-2-094(070)275_XSEC_PS&E_Color
IM-2-094(070)275_XSEC_Final_Plans_#of#_ED
(replace # with actual numbers, example 3of3)
IM-2-094(070)275_XSEC_Final_Plans_PE
IM-2-094(070)275_XSEC_Final_Plans_Color_ED *

IM-2-094(070)275_XSEC_Final_Plans_Color_PE *

IM-2-094(070)275_XSEC_Addendum1_ED
IM-2-094(070)275_XSEC_Addendum1_PE
IM-2-094(070)275_XSEC_Plan-Rev1_ED
IM-2-094(070)275_XSEC_Plan-Rev1_PE
IM-2-094(070)275_XSEC_Plan-Rev2_ED
IM-2-094(070)275_XSEC_Plan-Rev2_PE
IM-2-094(070)275_XSEC_Asbuilt
IM-2-094(070)275_XSEC_Asbuilt_Color

* At this time, color final plans are not posted on the internet for bidding purposes. They may be used by field personnel as an added convenience.

This naming convention should also be used for naming InterPlot Organizer files (.ips files) with the exception of the volume suffix. The Iplot Organizer file doesn't need to be split into volumes. Therefore the volumes suffix is not needed.

CADD Standards

After the final plans have been completed, the Preliminary and PS&E version of these files should be deleted from the project directory. Versions of PPS, IPS and PDF plans created for PE stamping should be purged after the paper set of plans has been officially approved and stamped.

Electronic Distribution Statements must be used as noted in the North Dakota Administrative Code, Title 28, “28-02.1-08-03.9”. PDF plan sets without the electronic Distribution Statement will not be accepted for final plans, addendums and plan revisions. The NDDOT can not use PDF plan sets without the Electronic Distribution Statement for electronic distribution.

Consultants doing work for the NDDOT shall not submit pdf plan sets with an electronic PE stamp. Plan sets with an electronic PE stamp are not to be distributed electronically.

Optically scanning the original paper plan set in order to create a pdf plan set is discouraged because the image quality is degraded and an electronic distribution statement is needed. PDF plan sets created directly from optically scanning the original paper plan sets must be revised with an electronic distribution statement. The electronic distribution statement is needed whenever the plans are distributed electronically.

Consultants must submit all types of plans in both color, and “black and white”.

CADD Standards

2.10 Plan Distribution

Feb 2009

Preliminary and PS&E Plans

Refer to the Design Manual for more information on the PS&E plan review process.

1. Create a black and white PDF of the plans. You may want to make a separate color PDF version of the plans (this is optional, designer's discretion).
2. Launch Internet Explorer and type "[ftp.state.nd.us](ftp://ftp.state.nd.us)" in the address bar and press Enter.
3. The Login As dialog box should open after you press Enter. If the dialog box doesn't open, try typing in the ftp address again.
4. Contact the CADD Support Specialist if you need to learn the User Name and Password needed to Login to the FTP site.
5. Double click the Public folder to open it.
6. Copy your PDF file from the corresponding project DIP folder to the Public folder on the ftp (file transfer protocol) site.

Final Plans

1. Create a hard copy of the plans and have it Sealed by a PE.
2. If the Federal Highway Administration (FHWA) has full involvement, a reproduction will need to be made of the sealed plans.
3. Send the hard copy/copies to the Transportation Programming Manager in Planning & Programming on or before the project completion date (8 weeks prior to bid opening.)
4. Create a black & white PDF files.
5. The electronic (PDF) versions of the plans need to be submitted to the Transportation Programming Manager within one week of the project completion date. Copy the PDF files to O:\81 Special Projects\DIP PLANS and send the Transportation Programming Manager a link to the files:
 - a. Start a new e-mail message from Microsoft Outlook.
 - b. In the body of the letter type the Project Number with the phrase "Final Plans" (Ex. IM-2-094(070)275 Final Plans.)
 - c. Highlight the words you just typed.
 - d. Click on Insert => Hyperlink on the menu bar.
 - e. Type the file path in the URL field (Ex. O:\81 Special Projects\DIP PLANS\IM-2-094(070)275_Final_Plans_ED.pdf.)
 - f. Click the OK button.
 - g. Put the Job Number and Project Number in the subject line of the e-mail (Ex. Job #4 – IM-2-094(070)275.)
 - h. Send the e-mail to the Transportation Programming Manager.
6. The Transportation Programming Manager will remove the file from O:\81 Special Projects\DIP PLANS when the files are ready to be sent out.

CADD Standards

7. If you need to make a change to the plans, contact the Transportation Programming Manager to see if you can still switch the hard copy sheets and create a new electronic version of the plans. You may have to create an Addendum for the sheets you want to change.

Addendums (after authorization – prior to bid opening)

Refer to the Design Manual for more information on the addendum process. Also refer to section 5.2 of this manual (Adding Files to Digital InterPlot Organizer).

1. Create a hard copy of the plans and have it Sealed by a PE. Remember to make the files read-only after the plans have been sealed and the electronic distribution statements have been added.
2. Prepare a memo describing the plan changes and have it signed by the Design Engineer.
3. Send a copy of the memo and a reproduction of the original sealed hard copy to Construction Services and Planning & Programming.
4. Send the original sealed hard copy of the plans to the Transportation Programming Manager in Planning & Programming for reprinting.
5. Create the black & white PDF files.
6. The electronic (PDF) versions of the plans need to be submitted to the Transportation Programming Manager when the original sealed hard copy is sent (see the instructions in step 5 of the Final Plans section above.)
7. The Transportation Programming Manager will remove the file from O:\81 Special Projects\DIP PLANS when the files are ready to be sent out.

Change Orders (after bid opening)

Refer to the Design Manual for more information on the change order process.

1. Create a hard copy of the plans and have it Sealed by a PE. Remember to make the files read-only after the plans have been sealed and the electronic distribution statements have been added.
2. Prepare a memo describing the changes for each sheet, including any changes in quantities (with estimated cost based on contract bid price.)
3. Send the original memo and the original sealed hard copy of the plan sheets to the District office.
4. Create black & white PDF.
5. E-mail the electronic (PDF) versions of the plans to the District office.
6. Place a copy of the memo and a reproduction of the original sealed hard copy in front of the original plans in the Record Center.

CADD Standards

2.11 Current Software

Feb 2009

The NDDOT is presently using the following versions of software;

- AutoTurn 6.0
- Axiom Toolkit
- Axiom Title Block Administrator 8.7a
- Bentley View 08.09.04.51
- GuidSign 5.0
- GEOPAK 8.09.06.31,
- Image Viewer 09.01
- MicroStation 8.09.04.101

Consultants working for the NDDOT shall implement MicroStation 8.09 and Geopak 8.09 by January 1, 2009.

CADD Standards

2.12 Current Resource Files

February 2009

The following table show the update dates for CADD Standard Resource Files.

MicroStation Files

Description	File Name	Updated
Cell Libraries	Cells.exe	01-09
Dictionaries, Annotation Scale Definitions, Tag Library	Data.exe	10-08
DGN Libraries	dgnlib.exe	01-09
Line Styles, Fonts and Colors	LinestylesFontsColors.exe	11-07
Macros	Macros.exe	10-08
Plotting	Plotting.exe	10-08
Seed Files	SeedFiles.exe	11-08
Settings Manager – Select Settings	Groups.exe	01-09
MDL	MDL.exe	10-08
VBA	VBA.exe	01-09
Workspace Configuration and Setup Files	ConfigurationFiles.exe	01-09

Geopak Files

Description	File Name	Updated
Criteria Files	Criteria.exe	12-08
Design and Computation Manager	DCM.exe	10-08
Sheet Library	Sheets.exe	11-08
Super Elevation	GeopakSuperElevation.exe	10-08
Survey Manager and Legal Library	SMD.exe	10-08

CADD Standards

MicroStation

3.1 Seed Files

Oct 2008

Seed files are used to set a number of .DGN file parameters. When a new .DGN is going to be created, the operator needs to select the correct seed file. The seed file is actually a .dgn file itself. The following are some of the features adjusted in the NDDOT seed file (NDDOTseed.dgn).

1. Global Origin and Auxiliary Coordinates
2. Working units
3. Color Table

CADD Standards

3.2 Global Origins and Coordinate Systems

July 2007

The global origin and auxiliary coordinate system settings in a MicroStation design file will not need to be changed or created if the correct seed file is used. The correct settings have been saved in the respective seed files.

To check the existing global origin of a file, key 'GO=?' into the key-in box. The value will appear in the bottom right-hand corner of the screen. **Do not key in any other GO commands - except 'GO=?', the coordinate values of existing points in the design file could change!**

Be very careful when referencing files together. If the active file has a different global origin than the reference file, the data may appear to reference into the active file correctly, but the coordinate values of the referenced data may change!

Before creating any new file, check what global origin has been used in other files within the directory. The new file should match that setting. Find the correct Seed File and create the new design file using that seed file.

Following is a partial list of available seed files with their units of measure and global origins:

Seed File Name	Units Of Measure	Global Origin Value	Auxiliary Coordinate System Origin
NDDOTseed.dgn (2D)	feet & thousandths	X=0 Y=1,000,000	X=2147483.6480 Y=1147483.6480
3D_NDDOTseed.dgn	feet & thousandths	X=0 Y=1,000,000 Z=2,000,000	X=2147483.6480 Y=1147483.6480 Z=0147483.6480

When creating a new plan view drawing, assumed drawing coordinates should be avoided. Plan view drawing elements should be drawn as close to real ground coordinates as survey data allows. Using real ground coordinates will help with the exchange and comparison of data with other sources (example; wetland delineations can be compared to all plan view drawings if real ground coordinates are used, GIS data can easily be imported into MicroStation).

CADD Standards

If real ground coordinate survey information is not readily available for projects such as ones that use 90-1 surveys, spatially correct base maps should be used to get reasonably close to real ground coordinates. MicroStation base maps can be referenced from the directory

R:\project\BaseMaps. Each county has its own base map because each county has a slightly different projection. Highway centerlines, Mile Points, and Section lines are some of the drawing features that can be used to tie plan information to real ground coordinates. The base maps are exported into MicroStation with a high degree of accuracy, but the accuracy of the GIS data varies considerably. Users should be conscience of the degree of accuracy when comparing information. Just because information is very close doesn't always mean it is acceptable.

CADD Standards

3.3 Settings Manager

Feb 2009

The MicroStation “Settings Manager” is the primary way the NDDOT manages element symbology. A good understanding of this tool will simplify the placement of most drawing elements. This tool is used to change several settings at one time and select a specific tool. Example; the level, color, line weight and style, text height and width and justification could all be switched and the place text tool could all be activated with one click of a button.

There are several Settings Manager files (STG). Each STG contains elements specifically related to a specific drawing or group of drawings. It is essential that data contained in a particular “stg” file is used for the appropriate drawing. For example, existing power poles are found in the Topog.stg and they should be drawn in the file named Topog.dgn. Several “stg” files are intended for only one particular type of drawing. Some “stg” files are intended for a group of drawings. *Appendix A* explains which “stg” files are used with which drawings.

The standard NDDOT interface (MicroStation Set-up) has links built into the pull down menu that will activate a specific STG. For example; to activate the Topog STG, a user would select “NDDOT>Select Settings>Photo>Topog”. The following list shows how the standard shortcut links are organized in the pull down menus.

Bridge

Bridge.stg

Design - Plan Sheets

001TS_Title.stg

004SW_Scope.stg

011DT_Data_Tables

020GD_Details.stg

030TP_Typical.stg

Cut_Sheets_Design.stg

Design - Main Drawings

Consign.stg

Countour.stg

Design.stg

DS_Align.stg

DS_Util.stg

Fencing.stg

Paving.stg

Profile.stg

Removal.stg

Seeding.stg

Shape.stg

Xsec.stg

Wetland_Impacts.stg

Materials

Materials.stg

PitPlat.stg

Photo

Control.stg

RW_Bndry.stg

Topog.stg

CADD Standards

Planning

Planning.stg

Traffic - Plan Sheets - 100WZ Work Zone

100WZ_CSDtl.stg
100WZ_LTmpLt.stg
100WZ_DTmpLtDe.stg
100WZ_LInt.stg
100WZ_DIntDe.stg

Traffic - Plan Sheets - 110SN Signing

110SN_LRemSign.stg
110SN_LSign.stg
110SN_DSignDet.stg
110SN_LOH.stg
110SN_DOHDet.stg

Traffic - Plan Sheets - 120MK Pvmnt Mkg

120MK_LPvmt.stg
120MK_DPvmtDet.stg

Traffic - Plan Sheets - 130GR Guardrail

130GR_LGdrl.stg
130GR_DGdrlDe.stg
130GR_LJBar.stg
130GR_DBarrier.stg

Traffic - Plan Sheets - 140LT Lighting

140LT_LLight.stg
140LT_DLitDe.stg
140LT_LHM.stg
140LT_DHMDet.stg
140LT_LUL.stg
140LT_DULDet.stg
140LT_LLitOH.stg
140LT_DLitOH.stg

Traffic - Plan Sheets - 150SL Signals

150SL_LInt.stg
150SL_DIntDe.stg
150SL_LRemSgl.stg
150SL_LSgnl.stg
150SL_LScop.stg
150SL_DSigDet.stg
150SL_LFlsh.stg
150SL_DFlsh.stg

Traffic - Plan Sheets - 160IT ITS

160IT_LITS.stg
160IT_DITSDet.stg

Traffic - Main Drawings – Signing

LRemSign.stg
LSign.stg

Traffic - Main Drawings – Pavement Marking

LPvmt.stg

Traffic - Main Drawings – Guardrail

LGrdrl.stg
LJBar.stg

Traffic - Main Drawings – Lighting

LTmpLt.stg
LLight.stg
LUL.stg
LHM.stg

Traffic - Main Drawings – Signals

Lint.stg
LRemSgnl.stg
LSgnl.stg
LScop.stg
LFlsh.stg

Traffic - Main Drawings – ITS

LITS.stg

CADD Standards

In order to use the Settings Manager correctly, the drawing scale must be set. Guidelines have been set up for placing cells, custom line styles, text, patterns, etc. to insure uniformity in all prints. For example, one user is creating a border sheet set to plot at 1"=40' and another user is creating a border sheet set to plot at 1"=200'. If both sheets were plotted and compared, the text in the title block should be the same size even though they were plotted using different scales. By using the MicroStation "Settings Manager", a user can place cells, custom line styles, text, patterns, etc. quickly and easily, because the scale factor is automatically set.

The Following is an example of how settings manager is used. In this example, setting the drawing scale with in the STG will be demonstrated. This example uses the "All_Cut_Sheets.stg" file. These steps can be used for all STG files.

Setting the scale of your drawing

1. If not already active, open the Settings Manager for "All_Cut_Sheets.stg" by going to the MicroStation menu bar and selecting "NDDOT> Select Settings> Design>All_Cut_Sheets".
2. In the "Select Settings" dialog box, select "Category>Scale".
3. Select the appropriate plotting scale in the "Select Scale" dialog box. Selecting a scale will not affect any existing elements in the design file. It will only affect elements placed using the Settings Manager.

Placing the border sheet cell

4. In the Group window select "Cells".
5. In the Component window select "Sht Plan".
6. Place the border sheet. The border sheet will be automatically placed for the plotting scale selected by the user.

Placing text

7. In the Select Settings dialog box, select the "Annotations" group.
8. In the Component window, select "Blk Title (09)".
9. The "Place Text" dialog box and the "Text Editor" will automatically open. Experiment with different types of text in the Component window and notice how the height and width of the text automatically changes in the "Place Text" dialog box. When ready to place text, click in the Text Editor box and begin typing the text to be placed.

CADD Standards

The user can also place cells, custom line styles, patterns, etc. by using the same technique. If any of these components are placed by using the “Settings Manager” in this way, they will all be placed at the correct scale for the plotting scale selected.

To plot at a different scale, simply select a different scale and anything placed using the “Settings Manager” will be placed at the new plotting scale selected. If the user changes the scale while placing a component, the component must be reselected to update it to the new scale settings. When the user returns to a design file, the scale will be automatically set to the last scale selected in that design file.

CADD Standards

3.4.1 Levels

Oct 2008

Many levels are named with the noun first and then the adjectives, example “Pole Wood Cell Exst”. Abbreviations are often used. The “Exst” (Existing) adjective is used at the end of level names when applicable. Level names without the “Exst” adjective are intended to indicate an undefined or proposed state of presence.

Levels have been set up for specific pay items. The names and descriptions for these levels are based on the pay item spec-code number and description, example “722-3690_INLET SPECIAL 42IN”

Level descriptions are similar to level names except the “Exst” adjective, when used, is first and the element type is not used, example “Exst Pole Wood”.

Level numbers have been set up as an identification number. The digits in the number represent attributes of the items on that level. Most standard levels are numbered from 1,000,000,000 to 4,294,967,294. The numbering system is as follows: “A,BCC,CDD,DDE”

A – 1 digit – Type of element

1= Points, Lines, Curves, and shapes 2=Cells, 3=Text and Dimensions, 4=Patterns

B – 1 digit – Presence

0=Undefined, 1=Existing, 2=Proposed

C – 3 digits – Closest NDDOT Specification Number

Some CADD specific specifications have been added.

D - 4 digits – Subsection or NDDOT Code.

When used as subsection it helps ensure uniqueness.

E – 1 digit – Pay Item Use

0=No, 1=Yes

Notes

- The maximum level number in V8 is $2^{32}-2= 4,294,967,294$.
- STG component names are usually based on the level names except that the element type is not used in the component name.
- Special levels have been set up for raster attachments. These levels were added in order to accommodate MicroStation XM’s new attachment method and make it easier to find rasters.

<u>Level Name</u>	<u>Level Number</u>
“Raster Group 1”	101
“Raster Group 2”	102
“Raster Group 3”	103

Rasters should be attached to the default level named “Raster Group 1”. The levels “Raster Group 2” and “Raster Group 3” can also be used if you desire to stratify rasters by level.

CADD Standards

3.4.2 “ByLevel” Settings

October 2005

The standard Levels have been set up for “ByLevel” use. However, the linestyle scales have to be manually set by the user and only a few components of the “Setting Manager” and the D&C Manager use “ByLevel” settings. Presently, “ByLevel” settings are only recommended when they are used by the standard “Settings Manager” or “D&C Manager” files.

3.4.3 Level Libraries

Oct 2008

The level information is stored in drawing libraries (dgnlib) files. They are located in the directory “S:\Standard\XM \dgnlib\Levels\”. The standard workspace interface, pull down menu short cuts to Select Setting and Tasks, will automatically attach the appropriate level library as needed. Level libraries should be attached instead of imported. Level filters have been added for different disciplines.

CADD Standards

3.5 Line Styles

October 2008

Users are strongly encouraged to use Settings Manager to set the appropriate line style settings (see [Section 3.3](#)). A user could individually set the Level, Color, Weight, Style and Style Scale for each element. However, this is not recommended because changing each setting individually/manually takes more effort and time and has a higher potential for user errors.

The following equation shows the Line Scale Factor used for common Final Plot Scales. Users will not need to reference this equation if they use “Settings Manager”. The equation is given here, for users who need to manually set the line scale.

$$\text{Line Scale Factor} = \text{Final Plot Scale} / 20$$

Example; the Line Scale Factor for a 1” = 40’ Final Plot would be 40/20 which equals 2.

There are a few line styles that are not plotted with a “Scale Factor”. These line styles typically represent the true physical size of a feature such as guardrails, curbs, curb and gutter and dowel joints. These features are always drawn at the same scale and will be plotted on paper proportional to the plotting scale. These line styles are digitized by turning off the scale factor toggle. Again, if you use settings manager, it will turn on and off this setting as needed. The line styles that are drawn with a scale factor are highlighted with an asterisk in [Appendix B](#).

Certain line styles are directional, in that their pattern component is not symmetrical. An example would be the ‘Exst Wetland Delineated’ custom line style. The small filaments that represent vegetation and grasses should point in toward the water side of the wetland. Consequently, the line needs to be digitized in the direction that will produce this effect (counter-clockwise on a closed shape.) Check [Appendix B](#) for directional information.

Tech Tip: To easily change the direction of a line style, do the following:
On the menu bar under Tools → Tool Boxes → Check the Curves tool box



→ Click OK

Click on the Change Element Direction icon.
Identify the Element needing new direction
Direction of element changed!

CADD Standards

3.6 Cells

Oct 2008

NDDOT cell libraries are located at “S:\STANDARD\XM\cell\”. The following is a list of the active NDDOT cell libraries:

Bridge.cel	Bridge items
Cells_1_scale.cel	General cells placed at 1 scale
Cells_plot_Scale.cel	General cells placed at plot scale
Driveway.cel	Dimension driven driveway cells
Guardrail.cel	Guardrail items
Hatch.cel	Patterning items
Ltg_schematic.cel	Lighting schematic items
Pvmtmkg.cel	Pavement marking
RCBox.cel	Reinforce concrete box items
Sheets.cel	Sheet borders (see Appendix H)
Signs.cel	Signing items

For a comprehensive listing of the available cells (see [Appendix C](#)).

Some cells in the Signs.cel library contain “Data Fields”. By using data fields there is no need to drop the cell to edit the text in the cell. These cells can be easily identified by looking for the letters DF at the beginning of the cell’s description. For example, the description for the cell named R1_2U, is DF_SPEED LIMIT. To use these cells, place the cells and simply select the “Fill in Single Enter-Data Field” tool and click on the data field that needs to be changed.



Then type in the text and press “ENTER”. The data field will fill in with the text that was just entered. Data fields will appear as “_ _ _ _ _” within the cells. To ensure that these lines do not show up when the drawing is plotted, access the “View Attributes” through “Settings” and make sure the “Data Fields” box does not have an X in it.

CADD Standards

3.7.1 Annotation and Fonts

July 2007

All features on plan sheets should be annotated whenever possible. To ensure the final plans have a consistent and clear readability, operators must follow the standard guidelines for upper and lowercase letters, font type, annotation size, underlining and bolding, use of levels and abbreviations.

Lowercase annotation is used for all annotation except for capitalization at the beginning of a description (e.g. Bridge begins 1200+65.0) or when an abbreviation includes separate words (e.g., the abbreviation for power pole is PP, for cable guardrail is C Gdrl, for corrugated metal pipe is CMP).

The most common text font used for NDDOT plans is “151 NDDOT_Arial”. Some standard annotation is placed with font “152 NDDOT_Arial_Bold”, “3 Engineering” or true type font “Dot Matrix”. The use of fonts 152, 3 and “DotMatrix” are for unique situations as programmed into the “Settings Manager”, “D&C Manager” or other NDDOT standard tools. Engineering Font is used with some documentation created by GEOPAK in order to avoid formatting problems such as spacing and special characters. “DotMatrix” font is used with particular labels used on ROW plats. The only fonts to be used on NDDOT plans and related drawings are fonts 151, 152, 3, and “DotMatrix”.

Annotation should be underlined when it is in a title that is outside of a title block, or when it is a Pay Item. Slanted or italicized text will not be used on plan sheets.

Additional characters have been added to the font tables to enable the placement of such characters as fractions, Greek symbols and mathematical symbols. [Appendix L](#) lists the available characters. To draw a special character into a MicroStation drawing, open the “Place Text” box and enter back slash (\) followed by the special character number designation (from 0-255). The special character will be visualized on the screen and it can be placed by left mouse clicking.

Standards have been set for the size (height and width) of annotation. Settings Manager has been programmed with the standard sizes and should be used for the placement of most annotation. The typical annotation heights used on NDDOT plans range from 0.05 to 0.17 inches when plotted to paper. The “Height” scale factor needs to be adjusted to produce the required annotation height in plans. Example, if you wanted 0.05” text on a plan sheet printed at 1”=40” you would use a scale factor of 2 ($0.05 \times 40 = 2$). Remember if you use “Settings Manager”, the scale factors will automatically change with your drawing scale and selected component.

Plan Note sheets should use a 0.12” text height - (12) Arial font. The summary of “Estimated Quantities” should use a 0.09” text height - (9) Arial font.

CADD Standards

3.7.2 Abbreviations

July 2004

When so many features are annotated in a set of plans, space is at a premium. To generate more available space, operators should use abbreviations as often as possible. We have established a comprehensive list of abbreviations that are commonly used by the DOT. These abbreviation lists can be found in *Appendices E and F*.

Abbreviations are placed without any punctuation (e.g., CI is 23.9' lt of hyd at elev 1800.6').

If additional abbreviations need to be added to the glossary or appendix, contact a Standards Committee representative or use the Standards Request Form at the end of this manual.

CADD Standards

3.8 Dimensioning

Oct 2008

Dimension Styles are no longer embedded in the seed files. Dimension Styles are attached through the dgn library “Dimension_and_Text_Styles.dgnlib”.

The following table describes the dimension styles used by the NDDOT.

Dimension Style	Description
NDDOT0	This style is used for very fine detailing like the dimensioning used for some traffic details. Level = “dim (wt 0)”, Color = 7, Style = 0, Weight = 0
NDDOT1	This style is use for most dimensioning in NDDOT plans. Level = “dim (wt 1)”, Color = 7, Style = 0, Weight = 0
NDDOT2	This style is use to emphasize - bold dimensioning in NDDOT plans. Level = “dim (wt 2)”, Color = 7, Style = 0, Weight = 0
Floating 1	Uses level and color attributes that match the feature being dimensioned. Style = 0, Weight = 0
NDDOT Bridge	Bigger Arrow Heads. Level = “dim (wt 0)”, Color = 1&7, Style = 0, Weight = 0
NDDOT Bridge2	Same as “NDDOT Bridge” except terminators default inside
NDDOT Bridge3	Same as “NDDOT Bridge 2” except Secondary Units (text) enabled
NDDOT Bridge4	Same as “NDDOT Bridge 2” except for long leader settings.

There are several additional settings within the standard dimension styles. The following is an overview of some of these settings.

Dimension Lines- Level, color, line style and weight are as discussed above. Stack offset is typically twice the text height.

Extension Lines- Extension lines=On, Offset=.5, Extension=.5

Placement- Alignment=Optional, Location=Optional, Adjust Dimension Line=On, Center Size=2

Terminators- Terminators=Optional, Arrowhead=Filled, Min Leader=2X width, Width and Height should be set at a ratio of 3:1 based on the following chart:

width	height
1.125	.3750

Text- Orientation and Justification =Optional, Text Frame=None, Margin=0.5, Height and

CADD Standards

Width= If toggled off, will match current Text Attributes; If toggled on, match text heights from “Annotation” section of Standards Manual.

Tolerance- Not normally used. (Sets plus\minus tolerance displays for dimensions.)

Tool Settings- When dimensions are being placed for distances, lengths and offsets, the Left Extension and Right Extension toggles should be toggled on.

Units- Format=AEC, Units=English, Accuracy=Optional, Label=Optional, Show Secondary Units=Toggled off, Scale Factor=1.00

Unit Format- Units=Degrees, Accuracy=0 (normally), Display=DD MM SS (normally), Primary\Show Leading Zero=On

Note: the keyin for dimstyles in MicroStation XM is slightly different than V8. Dimstyles names with spaces require Quotes (“”) in XM. This is one function that creates an incompatibility with “select settings” between XM and V8.

CADD Standards

3.9 Patterning and Hatching

Oct 2008

Patterning and hatching is used for drawings that require material definitions, such as concrete, rock and excavations. A list of patterns is shown in [Appendix G](#).

Users are encouraged to use “Settings Manager” for patterning and hatching because several of the settings are automated. The “Typical.stg” contains several hatching patterns. If “Settings Manager” is not used, settings such as scale, row spacing, column spacing and angle will have to be manually calculated and entered.

The standard patterns are stored in the cell library S:\Standard\XM\Cell\Hatch.cel. To establish the correct values for the “Pattern Area” box, multiply the values given in [Appendix G](#) (for scale, row spacing and column spacing) by the final plot scale. For example, if the final plot scale is 1" = 200', and the pattern cell is “Lignite Coal,” the scale will be $0.5 \times 200 = 100$. Row spacing will be $0.15 \times 200 = 30$. Column spacing will be $0.15 \times 200 = 30$. And the angle remains at 45 degrees. Remember if “Settings Manager” is used, these settings are automated.

If an operator is working in a file with a lot of hatching or patterning, they should probably toggle off “Patterns” under “Settings,” “View Attributes.” This will help with refresh speed. If they toggle on “Associative Pattern” in the “Pattern Area” box, the operator will be able to manipulate the closed shape and still have the pattern fill the altered shape.

CADD Standards

3.10 Plot Drivers

November 2004

When a drawing is ready to be sent to a plotter, the appropriate plot driver must be selected. The plot driver “sets up” the drawing file into the correct configuration. It can affect origin position, selected sheet size, pen weights and many other settings.

Central Office CADD users should be using IPLOT to print. [Appendix M](#) is a catalog of the printers and drivers set up for the NDDOT. Some non-DIP plotters are also listed.

The table on the right is a line weight guide. It is provided as a cross reference for evaluating your plotter output. These widths have been used to develop the CADD standards.

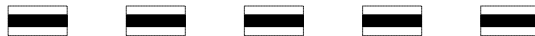
MicroStation Line Weight	Plotted Line Width	
	millimeters	inches
0	0.025	0.001
1	0.125	0.005
2	0.250	0.010
3	0.375	0.015
4	0.500	0.020
5	0.625	0.025
6	0.750	0.030
7	0.875	0.034
8	1.000	0.039
9	1.125	0.044
10	1.250	0.049
11	1.375	0.054
12	1.500	0.059
13	1.625	0.064
14	1.750	0.069
15	1.875	0.074

The "NDDOT print drivers" prints lines with the following attributes:

endcaps = butt
linejoin = round

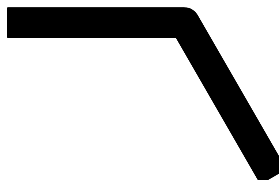
Endcap = Butt

This setting keeps the spaces in linestyles constant as the weights are increased



Linejoin = Round

This setting rounds the corners of joined lines

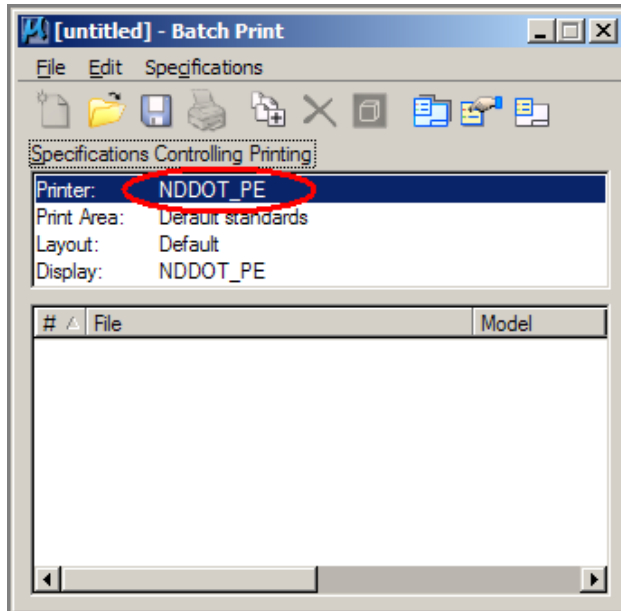


CADD Standards

3.11 Batch Plotting

Oct 2008

Batch plotting is a utility for plotting one or more design files at a time. A single batch plot job can print drawings from multiple directories. This section only discusses the NDDOT standards set up for batch plotting. Central Office users can use InterPlot Organizer instead of MicroStation Batch Plotting. The following is a quick guide for using the standards for batch plotting.

1. Use the NDDOT standard sheet cells.
 - a. The NDDOT standards for batch plotting use a plot boundary defined by a particular shape. These shapes are included in all of our sheet cells. The shape is the outer box with attributes; level = Sht Lines, color = 102, Weight = 1, Style = 1.
 - b. Do not use the “Use Shared Cells” option when placing sheets. Batch Plotting will not work correctly if this option is used.
2. Invoke batch print\plot under MicroStation file commands.
 - a. The MicroStation batch plot specifications should default to the NDDOT settings. You should be able to tell if the settings are correct if the Batch Plot dialog box shows printer settings starting out with “NDDOT...”.
 - b. If you don't get automatically get the NDDOT settings, see [section 2.5](#).
 - c. The batchplt.spc file is not a replacement plot driver. It is a supplemental file containing batch plot settings.
3. Select files to batch plot under the batch plot edit commands. Files can be in multiple directories.

CADD Standards

4. The default specifications may need to be changed. The typical settings used to create a pdf document are:

Printer:	NDDOT_PDF
Plot Area:	Default Standards
Layout:	Default
Display:	NDDOT_Black

If these specifications need to be adjusted, double click on the setting and a selection box will popup.

Note, the default layout forces tags on. If additional printer settings are required please contact the Standards Committee.

5. Batch plot by selecting print under the batch plot file command. The default printer (NDDOT_PE) is a “Set Up System Printer”. Click the “Set Up System Printer” button to pick a specific printer, paper size, paper orientation and other important settings. Click the “Print” button and then the “OK” button to send the prints to the printer.

CADD Standards

3.12 Referencing Drawings and Attaching Rasters

July 2007

All users, especially District and Consultant users, need to use the “Save Relative Path” options when referencing files. The “Save Relative Path” option will help keep the reference path integrity when the files are moved from one drive to another. The “Save Relative Path” option requires that the original directory structure is similar to the final directory structure. Reference paths must be the same through a common parent directory (higher level directory). See [section 2.1](#) of this manual.

Referencing by “Primary Search Paths” or by “Configuration Variables” is not the preferred method to reference drawings and attach rasters. Sometimes rasters are referenced from drawings in multiple directories. If this type of raster attachment is necessary, a project configuration variable file can be used. This project configuration file must be submitted with the project files. Consultants must discuss their use of “Primary Search Paths” and “Configuration Variables” for referencing with their assigned “Technical Support Contact”.

Broken reference paths are CADD Standard violations even if the references are not important. Unimportant-Temporary-Junk references and raster attachments should be deleted when final plans are completed. Consultants and District users should do this before the electronic files are submitted.

CADD Standards

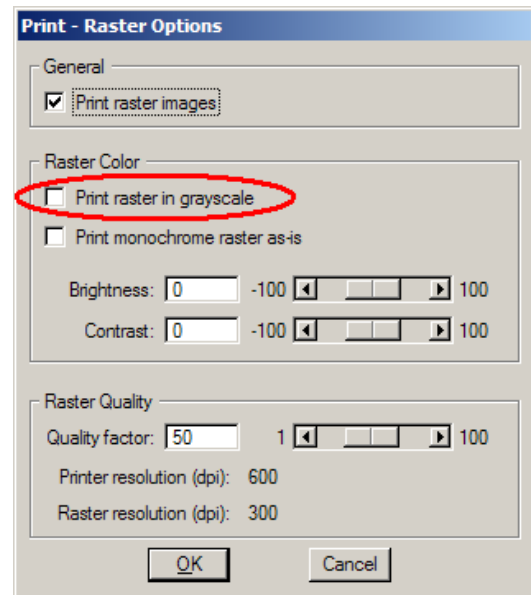
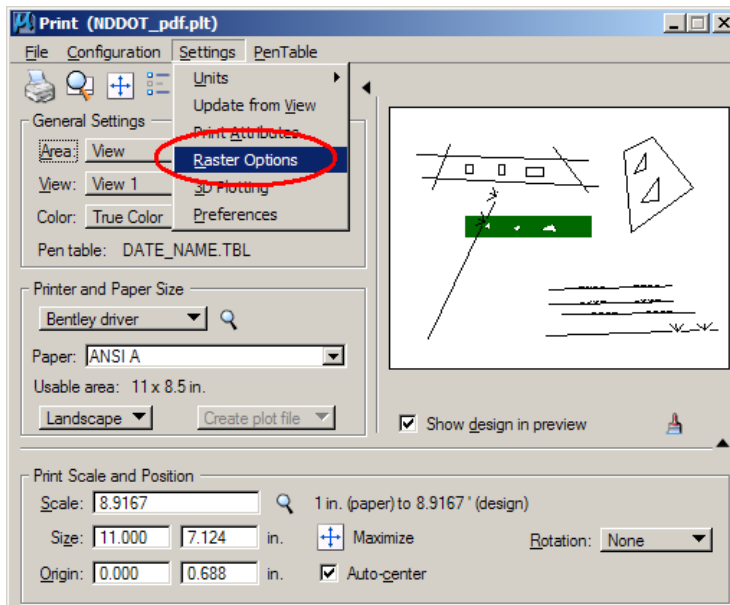
3.13 Printing Rasters (Pictures)

Oct 2008

Embedding pictures within a MicroStation drawing is discouraged. Don't cut and paste pictures into MicroStation. Pictures should be attached to drawings using Raster Manager. Pictures attached with raster manager are easier to adjust than embedded pictures.

Printing color pictures in grayscale is easier to do with raster manager than with embedded pictures. Color Pictures should be printed as grayscale when creating black and white plan sets.

The raster settings for printing with just MicroStation can be found in the "Print" dialog box under "Settings>Raster Options".



CADD Standards

3.14 NDDOT Custom Tasks (Task Navigator)

Oct 2008

Task Navigator is a tool that is similar to Select Settings. Tasks are tools used to coordinate tool functions and drawing symbology in one place. Details of these tools are not reviewed in this reference. Adoption of these tools in MicroStation is discussed.

A comprehensive group of task libraries has been developed. The structure and function of the task libraries is similar to that of “Select Settings – Groups”. The term Task used here entails related functions such as Templates, Tools and Annotation Scale. Several problems were encountered in the implementation of tasks. Most of the problems have been worked around with supplemental VBA. Details of these problems are included in the ***Appendix D***. There are many minor operational problems with Task such as access times and the complexity of workarounds – VBA. At this time both the Select Setting and Task will be supported.

3.15 Annotation Scale

Oct 2008

Select Settings (Groups) don't use the “Annotation Scale” function. When the Select Settings are used, the Annotation Scale should be turned off. NDDOT Custom Tasks do use “Annotation Scale” most of the time. The tasks turn on and off Annotation Scale as needed. If you are using both Select Settings and NDDOT Custom Tasks, make sure you remember to turn off “Annotation Scale” before using tasks.

The NDDOT uses custom Annotation Scale definitions which are located in the file S:\STANDARD\XM\data\scales.def.

The NDDOT site configuration file automatically points to the definitions and NDDOT Users only need to be aware that the file has been customized.

CADD Standards

GEOPAK

4.1 GEOPAK User Preference

Oct 2008

The following is a brief discussion on the “working directory” and “job directory” as set in the GEOPAK Users Preferences. The “working directory” is the location of the directory in which the working and support files are located. This directory can be set three different ways.

1. GEOPAK User Preference -Empty Default
2. GEOPAK User Preference -Defined Location
3. Project Manager

All users should be aware that there are three ways to set your working directory.

1. GEOPAK User Preference - Empty Default Method.

Many GEOPAK functions work properly without setting the “working directory” preference. If this preference is empty, GEOPAK will default to the directory of the first opened drawing. One disadvantage of this method is it can not be used when using GEOPAK to clip sheets that reference drawings in different directories; the working directory must be set to the directory that contains the clipped sheets. See Method 2 or 3.

2. GEOPAK User Preference - Defined Location Method.

This method is straight forward. Manually set the working directory to the appropriate location. This location is usually the directory in which your .gpk file resides.

3. Project Manager.

The working directory along with many other settings can be defined within the Project Manager. Once project manager is setup, the settings for the particular project are automatically implemented when project manager is invoked.

The settings in project manager overwrite the GEOPAK User Preferences. Therefore, using the project manager method to set the working directory, supersedes both methods 1 and 2, as described above. Note, just invoking project manager can set or reset the working directory to the project manager settings.

CADD Standards

The GEOPAK user - Cogo preference “job directory” is similar to the “working directory” preference. The “job directory” preference is used for Cogo files and if not set it will default to your working directory. Most users can leave this preference empty because they keep their Cogo files and drawings in the same directory. If the job directory is set, it also must be reset when switching between projects.

Notes:

- The “project name” field is optional.
- The initials “nd” (North Dakota) should be used for the “operator code” field.
- The “job number” field is required and is usually 001.
- The “subject” field is optional.

CADD Standards

4.2.1 GEOPAK Database (GPK file)

October 2005

The gpk file is the main project related GEOPAK file. It is usually stored in the working directory. Individual projects may have multiple .gpk files. Multiple .gpk files are often created and copied to protect the integrity of work. Users should be conscious of all .gpk files used on a project. Users are often required to copy other .gpk files and use the copied .gpk file as a starting point.

When users are first involved in a project they should closely examine what information is presently available in existing .gpk files before creating .gpk files of their own. Users are encouraged to copy .gpk information, in order to save time.

4.2.2 Cogo (Coordinate Geometry)

July 2007

Cogo is an acronym for Coordinate Geometry. GEOPAK's Cogo is an application that allows the operator to define alignments and other elements within a data base (gpk file). This data base is the backbone of a GEOPAK project.

CADD Standards

Elements stored in GEOPAK should follow the numbering convention shown below. The GEOPAK POINT NUMBERING SYSTEM should be followed even if multiple *.gpk files are created for a single project.

GEOPAK NUMBERING SYSTEM			
Numbers	Information at the Point		Typical User
1-100	Existing	Alignment	Survey - Photo
100-5999	Existing	Primary\Other Control	Survey - Photo
100-5999	Existing	Earth	Survey - Photo
100-5999	Existing	Public Land Survey System (Section Data)	Survey - Photo
100-5999	Existing	Photo Panels	Survey - Photo
100-5999	Existing	Topog	Survey - Photo
100-5999	Existing	Utility	Survey - Photo
6000-7999		Property Lines and Right of Way	ROW
8000-8999	Proposed	Alignment - Office Location	Design
9000-9999	Proposed	Topog Info (curb returns, sidewalk control points, etc)	Design
10000-10999	Proposed	Utilities-Drainage	Design
11000-11999		Bridge	Bridge
12000-13999		Testing and Sample Locations	Materials and Research
14000-14999		Construction - Change Order - As-builts	District
15000-19999		Reserved for CADD Standards Development	
20000-30000	Existing	Survey Data Overflow	Survey - Photo

Curve names should include a prefix “C” and use the same number as the PI point number. Example; the name for curve with a PI at point number 11, should be “C11”. Spirals should also be named in a similar fashion with an additional suffix. The entry spiral should have a suffix “A” and the exit spiral should have a suffix “B”. Example: a SCS with its combination PI at point number 11 would be made up of a spiral named C11A, a curve named C11, and spiral named C11B.

CADD Standards

Alignments

Alignments stored in GEOPAK should follow the naming convention shown below. All alignments require a standard prefix.

Standard GEOPAK Alignment Prefixes			
Type of Alignment	Alignment Prefix		
	Horizontal	Existing Vertical	Proposed Vertical
Survey Center Line	SCL	EXS	PRS
Existing Alignment – Alignment previously Defined in another set of plans – older plans	EX	EXE	PRE
Proposed Alignment – New Alignment Defined	PR	EXP	PRP

The prefix is based on the type of chain – alignment being stored. The rest of the name (body of the name) should be based on the street-roadway name and/or location. The body of the name should consistently be used in the horizontal alignment, existing vertical alignment, and proposed vertical alignment.

The following is a list of example Names:

Example Names for Alignments			
Type of Alignment	Alignment Name		
	Horizontal	Existing Vertical	Proposed Vertical
Survey Center Line for US Highway 85	SCL85	EXS85	PRS85
Existing Alignment for US Highway 85	EX85	EXE85	PRE85
Proposed Alignment for US Highway 85	PR85	EXP85	PRP85
Existing Alignment for the North West Loop Ramp for 10 th Street	EX10NWL	EXE10NWL	EXP10NWL
Proposed Alignment for the North West Loop Ramp for 10 th Street	PR10NWL	EXP10NWL	PRP10NWL
Existing Alignment for Interstate 94 Westbound	EX94WB	EXE94WB	PRE94WB
Proposed Alignment for Interstate 94 Westbound	PR94WB	EXP94WB	PRP94WB

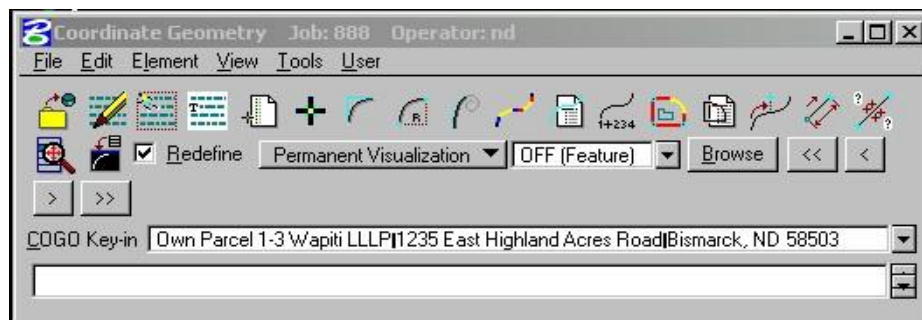
CADD Standards

Note, some of the alignments/profiles in the above examples might not be applicable or typical. You probably would not need to design a profile for EXP10NWL if you were going to have a profile for PRP10NWL. The combinations of example names were listed to show the naming pattern.

Cogo input files, journals, and output files have not been standardized, but users are strongly encouraged to develop and save these files in a manner which can easily be reviewed.

Parcels

A parcel is stored in GEOPAK using points, curves, spiral curves, or chains that were previously stored. Points can be stored from electronic field book data, graphical data from intersecting lines or traverse courses drawn into MicroStation. An owner's name and address can be stored with each parcel by invoking Coordinate Geometry and by keying in "Own Parcel" followed by the parcel name and the owner's name and address.



The Design and Computation Manager can read the information of the parcels and prints it into a dgn file along with the parcel boundary.

CADD Standards

4.3 Project Manager

October 2005

Project Manager is a coordination tool, organizing both GEOPAK functions and project information. Project Manager incorporates most GEOPAK road functions. Some road tools are only found in Project Manager (example: "Port Viewer" is only found in Project Manager). Project Manager can be used to set and store many project settings. It also provides dialog boxes that help create input files.

Notes:

- Projects should be created and maintained within each separate project's working directory. Example, The Survey and Photogrammetry section should set up one Project Manager and the Design section should set another Project Manager, separate Project Managers for the same project.
- The use of Project Manager will create sub-directories and files under the working directory.
- Project Manager Users Names should not be shared. Problems may occur if users try to share the same user name at the same time. Users should use their own name (email name) when working in project manager, but they should share the same "Operator Code". The initials "nd" (North Dakota) should be used for the "operator code" field. The "Name" field should be your email name (example: jcollado). The "Full Name" field should simply be your full name.

CADD Standards

4.4 Design and Computation Manager

October 2008

GEOPAK's Design and Computation Manager (D&C Manager) is used to draw features into a MicroStation design file using preset attributes and a designated GPK file. The D&C Manager is similar to the MicroStation Settings Manager, in that it can be used to draw a feature into a drawing and it will set the attributes of that specific feature to the current NDDOT Drafting Standards.

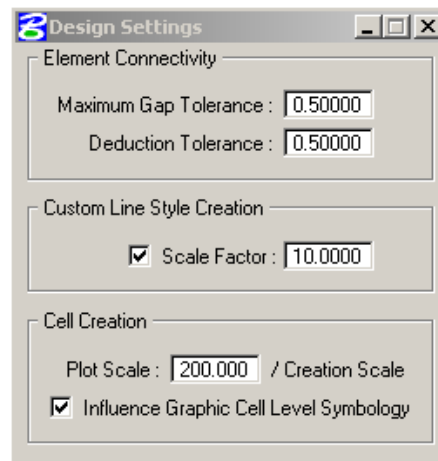
There are 2 standard Design and Computation Manager databases; NDDOT.ddb and NDDOT_PayItems.ddb. The default database for the D&C Manager should be NDDOT.ddb. If it isn't your default, see [Section 2.5](#) of this manual. The following outlines describe the general hierarchies of the database.

1. NDDOT.ddb
 - a. Drafting Standards
 - i. Alignments
 1. Horizontal
 2. Profiles
 - ii. Cross Sections and Typicals Sections
 - iii. Pavement Details
 - iv. Right of Way and Easements
 - b. Applications - 3 Port Criteria – Special GEOPAK programs-scripts
2. NDDOT_PayItems.ddb - Features that can be used in calculations of costs
 - a. SECTION - Section Number Divisions by hundreds
 - i. SPEC – Specification Number
 1. UNIT – Pay Unit Measurement

The DC Manager has several advantages over the MicroStation Settings Manager; The DC Manager draws Cogo features quickly, performs many quantity calculations and has advanced highlighting capabilities. The disadvantage is that the DC Manager does not contain all the standard features.

Note the scale factors in the DC Manager “Design Settings” needs to be adjusted for some cells and custom line styles to be drawn correctly. The line style scale factor is equal to the plot scale / 20.

Note, hatching and patterning symbology used in D&C Manager pay items don't automatically adjust for scale. Settings such as hatch spacing will need to be adjusted manually.



CADD Standards

The majority of the NDDOT pay items are in the D&C Manager (over 4000 items included). Some pay items units are difficult to visualize in a drawing like “Lump Sum” and “Hours”. These types of pay items are not included in the D&C manager. Most of the pay items don’t have unique symbology.

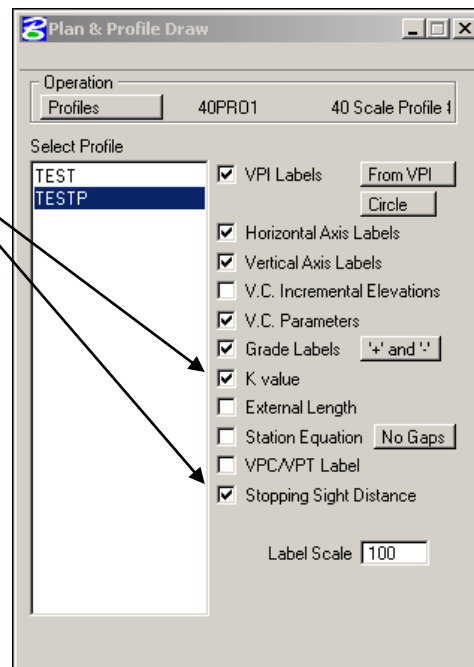
Notes for Drawing Profiles

The NDDOT D&C Manager’s Profiles were created with specific exaggerations (ratios of the horizontal scale to the vertical scale). If you don’t use these scales your curve table data may need to be manually adjusted.

Horizontal Scale	Vertical Scale	Exaggeration
40	5	8
60	10	6
80	10	8
100	10	10
200	20	10

The vertical curve tables have been set up to display the VPI station, elevation, stopping sight distance (SSD), k, and Length. Most of this information will display by default. However, user will need to manually turn on SSD and K. See the diagram below.

Turn on these settings



Don’t forget to set the correct “label scale” based on the final drawing scale. Examples; 40 scale profiles can only be draw when the label scale is set to 40, and 200 scale profiles can only be draw when the label scale is set to 200.

Notes for Drawing Horizontal Alignments

The horizontal alignment items have been setup for specific label scales. “Small – 80 scale and less” D&C manager alignments can be used for 40, 60 and 80 scale drawings. “Large – 100 scale and greater” D&C manager alignments can be used 100, 200 and 400 scale drawings.

CADD Standards

4.5 DTM

May 2000

Digital Terrain Models (DTM) are normally created in GEOPAK, using the “Applications”, “GEOPAK Road”, “DTM tools” box. From here a user can extract DTM information from a graphics file and create triangulation files (.tin), lattice files (.lat), contour maps, thematic maps and drainage maps. The .dtm’s are also the basis for creating cross-sections and vertical profiles.

CADD Standards

4.6 Survey Manager Database (SMD)

Oct 2008

The SMD file is used in the translation of data from survey data collectors to MicroStation Design files using GEOPAK Survey.

To begin the translation of data, the operator invokes the “Preferences” from Applications>GEOPAK SURVEY>Project>Preferences. Within the Preferences dialog box navigate to the Visualization tab. The SMD Feature File path should be set to s:\STANDARD\XM\GEOPAK\SURVEY\NDDOT.SMD. The “Apply Feature Best Match” toggle should be turned on and the “Plot Scale” should be set to the appropriate factor. For rural projects the scale should be set to “200” and for urban projects the scale should be set to “40”. The .SMD files are protected files and cannot be edited. If any operators have a need for additional items to be added into the .SMD they should contact a support person. The feature codes, used by field personnel to enter data into their data collectors, are listed in [Appendix I](#).

Linking Codes

The linking codes need to be set in the Preferences dialog box. They can be found under the Dataset tab in the Linking Codes item. They should be set as follows:

Begin Line:	=	+
End Line:	=	-
Close Figure:	=	!
Beg/End Curve:	=	/
PC Curve:	=	XPC
PT Curve:	=	XPT
Curve Fit:	=	XCF
PCC Curve:	=	XCC
Continuation:	=	XCN
Left Right:	=	XLR
Front Back:	=	XFB
Up Down:	=	XUD
Duplicate Prefix:	=	XDU
Comment Char:	=	*

The linking codes that are prefixed with an “X” are not intended to be used, however they do need to be set to eliminate conflicts with the EFB codes.

Note: The Continuation linking code may be grayed out. You will have to set the definition of this code once you create a dataset in the XYZ to Coordinates dialog box.

CADD Standards

4.7 Earthwork and Criteria Files

July 2007

Criteria files are tools used for creating cross sections, calculating earthwork and generating reports. This is a major function of GEOPAK. This manual will not discuss criteria or earthwork in detail. It will only discuss how the standards pertain to criteria files. See the GEOPAK Manual for additional discussion of GEOPAK earthwork and criteria files.

All criteria files shall be included with the projects so that cross sections could be re-run. Hand editing should be avoided whenever feasible. Copy the standard criteria directory into the project directory every time a new project is started or use the typical generator. Certain criteria files may have to be edited. Also, the standard criteria files are edited from time to time. Creating - copying project criteria files will avoid multiple user complications. See [Section 2.4](#) for the location of earthwork related files.

All cross sections should have important points labeled in a manner such that blue top- slope staking reports can be generated.

Slope Stake Reports

Designers are responsible for creating a working cross section file in which a GEOPAK Blue top-slope stake report can be generated. At a minimum, a slope staking report showing the break points and tie points to the top of the topsoil shall be developed and provided to the field engineer. See Design Memo No. 01-2005. Reports for the bottom of topsoil and the bottom of base (top of dirt grade) should also be provided. However, the cross sections should be drawn so other base layer surfaces can be reported if the District or Design chooses to generate these reports at a later date. Presently the preferred file format for these reports is “Comma Separated Values” (CSV). This type of file can be opened with Excel and it is much easier to edit.

Blue & Red Top Report

Job 001 Cur Sta 15+25.00 R 1

Chain P19CL Report Decimal 3

Beg Sta 11+75.00 R 1 15+25.00 R 1

End Sta 31+25.00 R 1 16+50.00 R 1

Existing Ground Line

Level 6 Color 0-253 Select

Weight 0-15 Style 0-7

Proposed Finish Grade

Level 7,31,35,40 Color 1,18,109,14 Select

Weight 1-2 Style 0

Span Bottom

☒ Pause on Each XS

Chain EX129 Separator .

File c:\80029065.065\DESIGN\slopes

Apply

Blue
Red
Yellow
Table
XYZ
▶ CSV

CADD Standards

Revisions to criteria and the typical generator can be requested through the Standards Committee. If a user has a new criteria idea, they should discuss or submit the criteria file to the Standards Committee. New criteria ideas might be used to improve the standard criteria library. Following is the standard criteria requirements.

1. Standard criteria files should have a unique purpose. Redundancy is discouraged.
2. All standard criteria shall be documented. A labeled drawing shall be included in the standards. Standard criteria shall include a header. The criteria header shall include the following information; criteria name, author, revision date, description, inclusion sequence information, and list of variables. Criteria points and variables shall be cataloged in a spreadsheet. [Appendix J](#) contains a data base of criteria points and variables.
3. Criteria points and variable names shall be approved by the Standards Committee. Criteria points and variable names shall follow the following format. Criteria points shall be labeled for report generation. Points should have two labels; point number (level = “**Xsec Point Number Labels Text**”) and another label that would be useful in a segregated report (level = “**Xsec Point Description Labels Text**”). Example; a segregated report for just “Topsoil Bottom” points might be desired, so all topsoil bottom points should have a unique label like “TSB”. Note all labels need to be in capital letters in order to be recognized by GEOPAK. Test points do not need to be labeled. Generic text should be on level “Xsec General Text”.

The following information contains recommendations and notes for using criteria. Some of this information is not contained in the GEOPAK Manuals.

When using super elevation shapes to create cross sections, first process the proposed cross sections without using criteria files - no side slope conditions. This should only draw the roadway super elevation surfaces into the cross sections. Then check and correct any shape and input errors. Reprocess until there is a run without errors. After processing an error free run, reprocess with the criteria. Separating the proposed cross section process into smaller incremental steps should help users identify problems.

The **standard.x** criteria file defines how all GEOPAK cross section elements are located and then drawn. All standard criteria symbology should be located in this file. The standard.x criteria file may look for elements that do not exist in your drawings. This should not be a problem as long as the drawing file, in which the criteria is to search, exists. The log file will comment “element not found” and continue.

CADD Standards

4.8 Cross Section Sheet Library

Oct 2008

The NDDOT standard cross section sheet library (XSSL) is “NDDOT.xssl”. For NDDOT users, GEOPAK should default to this library when the “Cross Section Sheet Composition” tool is invoked. This tool can be found in the “Cross Sections” tool tray or from the pull down menu (Application>GEOPAK Road>Cross Section> Cross Section Sheet Composition). If the NDDOT.xssl is not your default XSSL, see [Section 2.5](#).

Users may need to save minor layout changes to the XSSL, such as the display of earthwork quantities on the cross section sheets. The XSSL in the standards directory is “write” protected. If changes to the XSSL are required, the file (NDDOT.xssl) should be copied to the project directory so that changes can be saved. Then the XSSL in the project directory should be used for creating cross section layout sheets.

There are several sub-dialog boxes within the “Cross Section Sheet Composition” dialog box. Most users only need to edit information in the “XS DGN File”, “Sheet DGN File” and the “Earthwork Quantity Labels” sub-dialog boxes. See the GEOPAK Manual if additional help is needed.

Most users will use the “Active Cross Section Sheet” layout of “XS 20 scale or Less” with a 1 to 1 grid. However, other layouts are available from the pull down field.

The XSSL is used in conjunction with the cross section sheet cells found in the NDDOT sheets library (sheets.cel). The library uses a scalable cross section sheet and references the working cross sections into your cross section sheet layout drawing.

On large projects, hundreds of cross sections may be referenced into one drawing. Users may find it is easier to manage these drawings if they draw only one sheet per drawing model. This option is found in the “Sheet DGN File” sub-dialog box.

CADD Standards

4.9 Plan Sheet Library

Oct 2008

The GEOPAK Plan and Profile sheet layout tool is used to automate the creation of plan and profile sheets. In this process, many new drawings are created that can contain a number of referenced drawings. These newly created drawings are formatted to present information in traditional, manageable sized sheets.

The table below lists the sheet layouts that are presently available. If additional types of layouts are needed, please contact a Standards Committee Representative.

SHEET NAME	CELL NAME
Plan and Profile Sheets1	PP10
Plan and Profile Sheets2	PP10S60
Plan and Profile Sheets3	PP10S80
PLAN A (Margins; Lt.=0 Rt.=0.0 Top=0.5 Bottom=1.5)	PLAN
PLAN B (Margins; Lt.=0 Rt.=0.0 Top=0.5 Bottom=2.5)	PLAN
PLAN C (Margins; Lt.=0 Rt.=4.5 Top=0.0 Bottom=0.0)	PLAN
PLAN D (Margins; Lt.=0 Rt.=4.5 Top=0.0 Bottom=1.5)	PLAN
PLAN E (Margins; Lt.=0 Rt.=4.5 Top=0.0 Bottom=2.5)	PLAN
PLAN F (Margins; Lt.=0 Rt.=4.5 Top=0.5 Bottom=2.5)	PLAN
PLAN T (Margins; Lt.=1 Rt.=1.0 Top=0.5 Bottom=1.5)	PLAN
PLAN MAX (Margins; Sheet Polygon)	PLAN
ROWPLAT	RWPLAT

All the different sheet layouts, such as cross section sheets, right of way plats and plan and profile sheets, are designed to be placed as cells. Some sheet cells can be plotted at different scales, others are designed to be plotted at only one scale.

Sheet cell origins are located in the lower left corner, at the intersection of the bottom and left borders. A list of available sheets is included in [Appendix H](#).

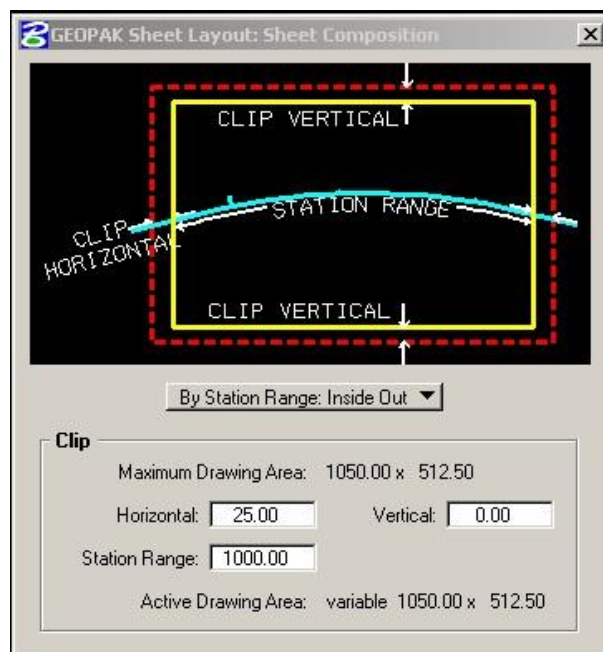
CADD Standards

Most sheets laid out with the NDDOT standards are designed with an overlap. The total overlap is the sum of the beginning and ending overlap. Two different sheet compositions are used within the CADD Standard Plan Sheet Library. The CADD Standards only use 2 out of the 4 “sheet composition” methods.

For Plan and Profiles Sheets, you should use the sheet composition method of **“By Station Range: Inside Out”**. For all other sheets, you should use the sheet composition method of **“By BeginStation\Overlap”**.

“By Station Range: Inside Out” Example:

A user wants to layout plan and profile sheets at a horizontal scale of 100. The user would select “Plan & Profile Sheets1” from the “NDDOTSheet.psl” and set the scale to 100. The primary coverage (Station Range) is set to 1000 ft. However, this does not include the overlap. The actual plan drawing area will be noted in the Sheet Composition dialog box, in this case, 1050' x 512.5' (see dialog box below.) The primary horizontal coverage is 1000' and the actual coverage is 1050'. In this case the horizontal clip is actually an additional clip outward of 25' on both sides ($25 + 1000 + 25 = 1050$). Users are expected to realize from these numbers that the overlap is 50' ($1050 - 1000 = 50$). This overlap is split equally between the beginning overlap and ending overlap, in this case 25' and 25' respectively. See diagram below. The user must start the sheet layout process at an even station if they want their sheets to line up with the grid lines.



CADD Standards

The following table summarizes composition settings for plan and profile sheets. These sheets use the **“By Station Range: Inside Out”** method.

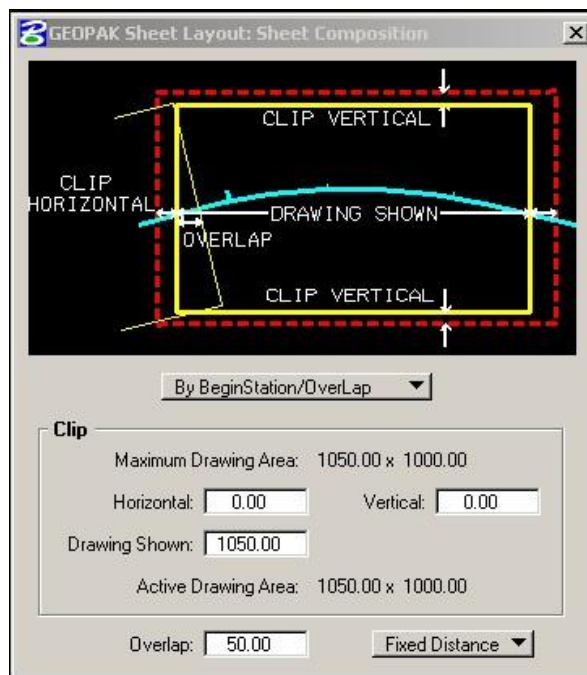
Scale	Clip Horizontal	Clip Vertical	Drawing shown
40	10	0	400
60	15	0	600
80	20	0	800
100	25	0	1000
200	50	0	2000

“By BeginStation\Overlap” Example:

A user wants to layout plan sheets at a horizontal scale of 100 with 1000 feet of coverage, starting at station 10+00. In this case, the user would select Plan C from the plan sheet library. Note that Plan C settings will provide no margins between the clip area and the sheet border cell for the top, bottom and left edges. However, a 4.5 inch margin will be provided between the clip area and the sheet border for the right edge. This 4.5 inch margin area is often used for quantities.

As discussed earlier, most of the sheets are designed for an overlap. In this example, the actual length of plan view is 1050' long. The actual plan drawing area will be noted in the “Active Drawing Area” (1050.00 x 1000.00). Users are expected to realize from this number that there is 50' overlap. The primary horizontal coverage is 1000' (1050' actual coverage – 50' overlap = 1000' primary coverage).

The overlap is split equally between the beginning overlap and ending overlap, in this case 25' on the left and 25' on the right. The user must start the sheet layout process, half the total overlap distance, before the desired station. In this case, the starting station would be 9+75. See diagram below.



CADD Standards

Additional Notes

“Plan A” and “Plan B” have no right margins between the clip area and the sheet border cell. Drawing information may overlap the area used for the Professional Engineer’s Stamp. Clip Mask the drawing information if that is a reasonable solution. If important drawing details are overlapped by the clip masking, use a larger overlap or a different sheet.

When sheets are clipped, you are given an option to “Rotate Reference” or “Rotate View”. Users should always “Rotate View”. If you “Rotate Reference”, your coordinate system will not be aligned with your drawing and the profile elevation axis within plan and profile sheets will not be aligned.

The use of a “Motif” files provide several benefits. Motif files can provide a consistent template of reference files including level display. The Motif file can control what is referenced and what is displayed. If you are using motif files and creating similar cut sheets several times during plan preparation, you don’t have to be concerned with what files are referenced to your main drawings, what is displayed and when settings are changed. These settings are independently controlled by the motif file. The motif file can also eliminate unnecessary references. Example, in a plan and profile sheet, references of design.dgn are seldom needed in the profile and tabular data views. Separate motif files, using different sets of reference files, can be used for each view.

Having cross sections referenced to drawings used to clip plan or plan and profile sheets may slow down the sheet creation process. Detach unnecessary reference files before clipping sheets.

CADD Standards

4.10 Super Elevation

Oct 2008

The NDDOT uses the AASHTO radius tables to calculate super elevation. The 6% e max tables are used for most highway designs (rural-high speed). The 4% e max table is sometimes used by NDDOT for urban moderate (30 to 50 mph) speed roadway designs.

Super elevation runoff and tangent runout are based on a “desired relative gradient”. The “desired relative gradient” is 83.3% of the “maximum relative gradient” as shown on page 170 of “A Policy on Geometric Design of Highways and Streets”, 2001. This “desired relative gradient” results in runoff and runout lengths that are 120 % of the minimum lengths ($120\% = 1 / 83.3\%$)

For non-spiral curve combinations, 1/3 of the runoff is placed on the curve and 2/3 of the runoff is placed on the tangent. For spiral curve combinations, all of the super elevation runoff is usually placed on the spiral. Often, the super elevation runoff used in spiral curve combinations is changed to match the spiral length. Tangent runout should be directly proportional to runoff. On very long spirals, the tangent runout can be placed on the spiral if the maximum relative gradient is not exceeded.

Default NDDOT GEOPAK preferences have been set up for NDDOT users. The standard configuration file (standard.cfg) uses the NDDOT Super Elevation Preferences (NDDOT.sep). See [Section 2.5](#) (Configuration Settings, Preference Settings, and User Interface).

The NDDOT uses “Adjustment Factors” for increasing the runoff and runout length when multiple lanes are rotated (as shown on page 172 of “A Policy on Geometric Design of Highways and Streets”, 2001). Note, the “Adjustment Factors” are disabled (set to 1) in the default NDDOT.sep. The “Adjustment Factors” are disabled in order to simplify the modeling – shaping of shoulders. The majority of NDDOT roadways are modeled with 4 shapes within a shape cluster (shoulder shape + driving lane shape + driving lane shape + shoulder shape). The Shoulder widths should not affect the runoff and runout lengths. If a multiple lane facility is being designed, the NDDOT.sep should be edited with correct “Adjustment Factors” for rotating multiple lanes.

Note. If designers need to edit the super elevation preference file (NDDOT.sep), it should be copied, renamed and stored in the project directory.

CADD Standards

Simple Curve Example

Given

PI = 1409+95.59
PC = 1403+11.54
PT = 1416+73.20
Delta = 13d 37m 0s left
R = 5929.58
V = 75 mph

Solution

$e = 3.8\%$ interpolated from 6 % max table (5000' = 4.2 %, 6000' = 3.6 %)

Maximum Relative Gradient (MRG) = 0.38 % from table

Desired Relative Gradient (DRG) = MRG * 83.3 % = 0.317 %

Runoff on high side * DRG = e * width of traffic lane

Runoff on high side = $3.8\% * 12' / 0.317\% = 143.85'$

Runoff on low side * DRG = (e - normal crown) * width of traffic lane

Runoff on low side = $(3.8\% - 2.1\%) * 12' / 0.317\% = 64.35'$

Runout * DRG = normal crown * width of traffic lane

Runout = $2.1\% * 12' / 0.317\% = 79.50'$

Begin e on right side (high side) = PC - $2/3 * (\text{Runoff}) - \text{Runout} = 1401+36.14$

Begin full e = PC + $1/3 * (\text{Runoff}) = 1403+59.49$

End full e = PT - $1/3 * (\text{Runoff}) = 1416+25.25$

End e on right side (high side) = PC + $2/3 * (\text{Runoff}) + \text{Runout} = 1418+48.60$

Begin e on left side (low side) = Begin full e - (Runoff on low side) = 1402+95.14

End e on left side (low side) = End full e + (Runoff on low side) = 1416+89.60

CADD Standards

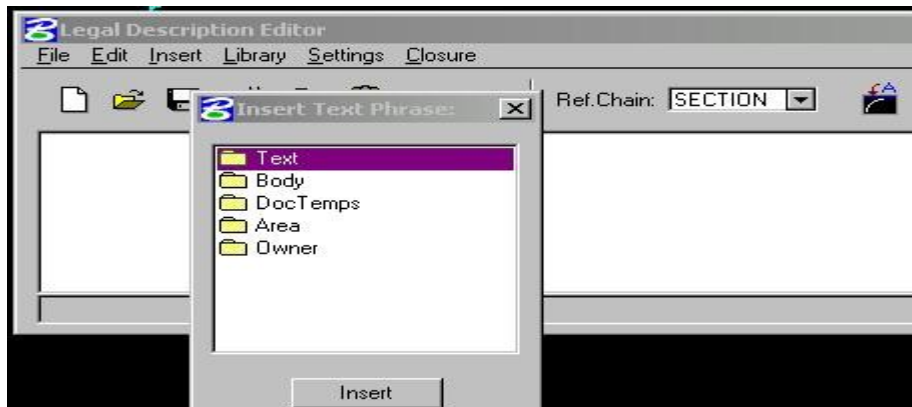
4.11 Legal Description Editor (Right of Way Plats)

Oct 2008

The “Legal Description Editor” is a GEOPAK tool used to create right of way legal descriptions. The Legal Description Library (NDDOT.ldb) is customized to conform to the standard NDDOT legal description format (Chapter 20 Right Of Way Plats; Procedures For Creating Right Of Way Plats). The general statements that are common to all descriptions are stored in the GEOPAK library. The Editor receives information unique to certain parcels from the GPK file, key-in, or lists provided in dialog boxes. Legal descriptions and parcel data are typed one time and stored in GEOPAK.

The Legal Description Editor can be used once the parcel is stored. Points, curves, and parcels must be stored in GEOPAK before using the Legal Description Editor. The Legal Description Editor is found in GEOPAK Road or GEOPAK Site under “\Geometry\Legal Description”. When selected, a dialog box with a menu will appear. The menu bar allows the user to choose a File, Edit the current file, Insert items into a legal description, select the desired Library, define Global Settings, or obtain a closure report on the parcel description.

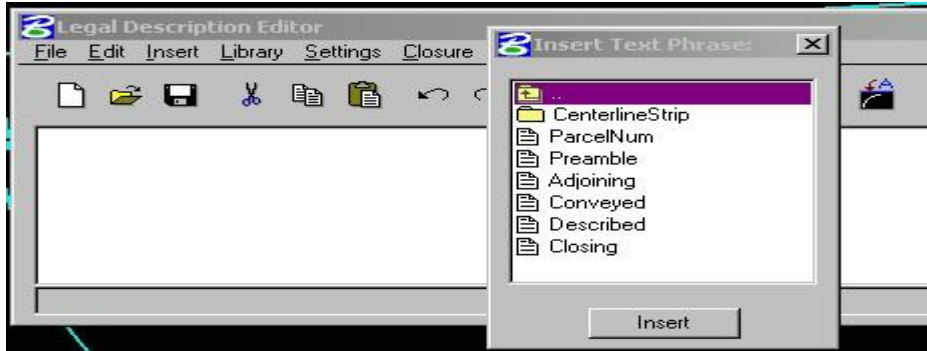
Go into Library to select the NDDOT.ldb library and hit OK. Select “Insert” on the menu bar then select “Text Phrase” from the pull down menu and the dialog box shown below appears.



CADD Standards

Text Folder

Following are steps and explanations concerning the items in the text folder. Select “Insert”, then “Text Phrase” folder. A dialog box appears with a list of Text Phrases to insert. Double click on “Text”. This folder contains phrases for parts of the description dealing with text statements only.



Parcel Number

The first item required to create the NDDOT legal description, is the parcel number. In the text folder, select “ParcelNum” and hit the “Insert” button on the bottom of the dialog box. The “library editor” will automatically print the phrase “Parcel Number,” centered over the description on the first line. A dialog box then appears. At the top of the box is a statement identifying the information needed to complete the first line of the description. In this case, it is the parcel number. Place the cursor in the top window and type in the name of the parcel or open the pull down. Keyed in information is stored in the temporary memory, while creating a legal description. This information will appear in the pull down. Choose information from the pull down, hit the “Add” button, and then hit OK. This will automatically add the parcel number to the text editor.

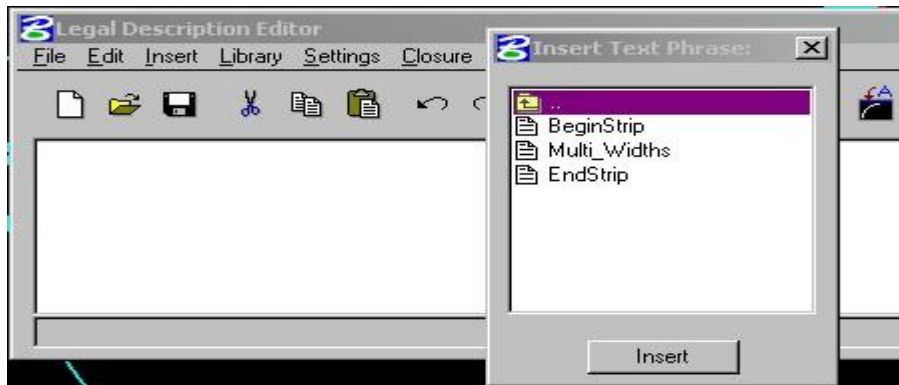
Preamble or Caption

The next required entry is the “Preamble or Caption,” from the Text Phrase dialog box, select “Preamble” and hit insert. The “library editor” will automatically print “A portion of” and a dialog box appears with “Aliquot part” on the top of the box. This is asking the user to type in the part of the section or subdivision that the parcel is located in. The library editor will fill in the general statements in a description and for any data unique to a description, a dialog box will appear to key-in or select data from a list.

CADD Standards

Centerline Strip folder

The centerline description of a strip of land that is parallel or referenced to a survey centerline follows the preamble. Below are explanations concerning the items in the “CenterlineStrip” folder, which is found in “Insert\Text Phrase\CenterlineStrip”.



BeginStrip

The editor prints “A strip of land” automatically, and then a dialog box appears for input of the strip width in feet. The next dialog box has a list of cardinal directions (northerly, westerly, easterly...) to describe which lines of the parcel are parallel.

Multi_Widths

The editor prints “And a strip of land” automatically, and then a dialog box appears for input of the strip width. The next dialog box has a list of cardinal directions to describe which lines of the parcel are parallel.

EndStrip

A dialog box appears with a list of cardinal directions to select the description of the line on the strip that is being described. Another dialog box is available with a list to select strip or strips (if multiple widths strip). The next dialog box contains a key-in to input the offset distance from the centerline, to the closest described line. The last dialog box has a list with cardinal directions to indicate the direction the closest line lies from the survey centerline. The Library Editor will then automatically complete the caption for the centerline description.

Closing

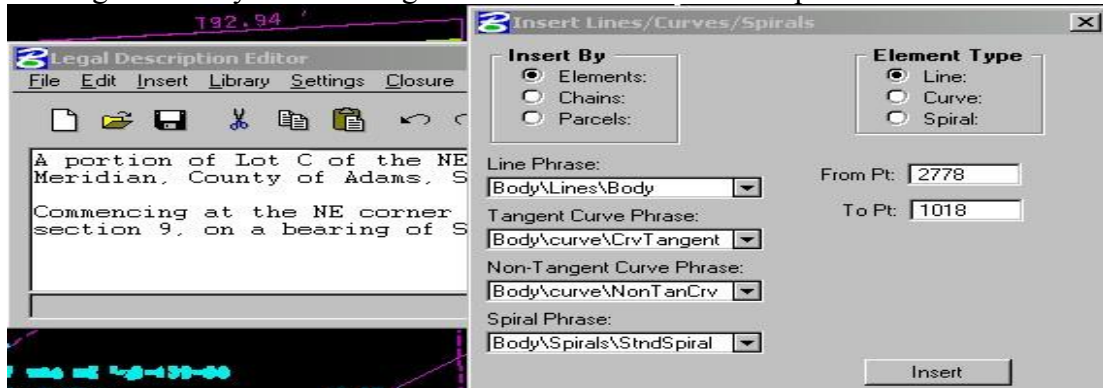
This statement is required at the end of the legal description. Select “Closing” then hit “Insert”, the editor will type in “The legal description was prepared by”. A dialog box will appear and on the top bar are the words “Insert name” this refers to the name of the person writing the legal description.



CADD Standards

Body Folder

Following are steps and explanations concerning the items in the Center Line folder. This is obtained by clicking on the "Line\Curve\Spiral Phrase" from the Insert pull down, a dialog box with a variety of choices pops up for these items. The first selection is outlined by a box with the heading "Insert By". Following is a list of the choices and explanations of the choices:



Elements

To create the "body of the description" based on existing "Elements," select,

Line: The user may enter points that were stored in the GPK file to identify a line; for example enter a stored point number in the "From Pt:" field and the end point of the course in the "To Pt:" field.

Curve or Spiral: the user may choose from a list of previously stored curves or spirals in the GPK file.

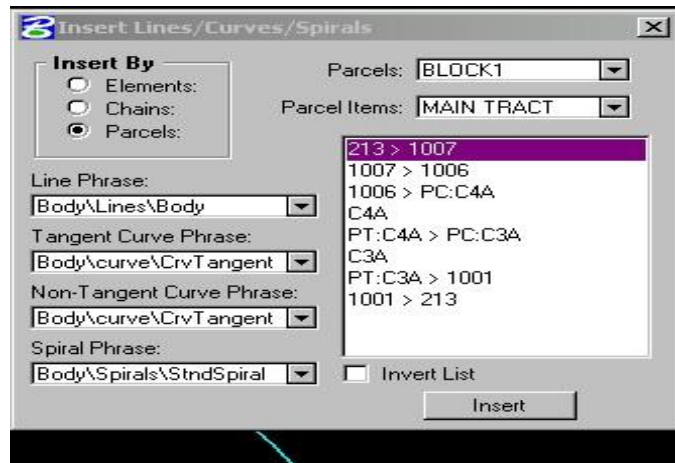
Chains

The user may choose from a list of stored chains in the GPK file from the pull down.

CADD Standards

Parcels

A pull down is available for the Parcels stored in the GPK file. The window to the lower right of the dialog box has a list of the parcel courses. The library will show each course as a “point-to-point chain” or a “point-to-curve” chain. If the points, chains, and/or curves of the parcel are not in a clockwise direction, check the box under the window to invert the courses. It will invert the parcel features but not the curves themselves. Select the parcel from the pull down in the upper right corner, highlight a course, and select the desired “Line Phrase:” statement. Hit “Insert” and the library editor will read the selected course from the GPK file in GEOPAK to print the correct data into the description.



Under the “Insert By” box are Line Phrase, Tangent Curve Phrase, Non-Tangent Curve Phrase, or Spiral Phrase pull down choices. Explanations for “Phrase” statements follow:

Line Phrases

This pull down contains different statements or line styles, which are listed below with an example. The bearings and distances are read from the data stored in GEOPAK:

Body\Lines\Body

“Commencing at the SE corner of section 26, thence northerly along the east line of section 26, on a bearing of N 01 deg. 11 min. 24 sec. E and a distance of 424.46 feet.”

This should be the first line used in the body. “Insert By” “Elements” or “Chains” can be used and the first point should be a Section Corner, Quarter Corner, or some known point.

Body\Lines\ToPOBLine

“Thence on a bearing of N 90 deg. 00 min. 00 sec. W and a distance of 422.01 feet to the point of beginning.”

Body\Lines\StdLine

“Thence N 90 deg. 00 min. 00 sec. W a distance of 422.01 feet.”

Body\Lines\BegCrv Line

“Thence N 90 deg. 00 min. 00 sec. W a distance of 422.01 feet”

This sentence is the same as “Body\Lines\StdLine” but does not have a period at the end; the purpose is to lead into a curve statement. The editor reads the line data for the course before the curve in this part of the statement. The remainder of the statement will require data from a previously stored curve. If the curve is non-tangent, data for the direction of the radius (Body\Lines\ToNonTanCrv) on the curve is required. Insert this before the curve data.

CADD Standards

Body\Lines\ToNonTanCrv

“to a point on a non-tangent curve concave (right), northwesterly, the radius point of which bears N 90 deg. 00 min. 00 sec. W.”

The statement for the non-tangent curve is in three different line statements. Insert the “Body\Line\BegCrv Line” statement first, this statement reads the non-tangent course data before the curve. Next insert the “Body\Line\ToNonTanCrv” (the present statement), the data required for this will read the direction of the radius. A data point must be stored at the curve center or radius point, then go back to the “Insert By” box and click on “Elements:” Enter the point number of the PC on the parcel in the “From pt” field and the point number of the curve center in the “To pt” field. From here click on the “Parcels” in the “Insert By” box and continue with the curve data in the parcel. The explanation for the third part of the statement, “Body\curve\NonTanCrv,” is in the curve section.

Body\Lines\ComAtForStrip

“Commencing at the NE corner of section 33, thence westerly along the north line of section 33, which is also the survey centerline of ND 6, on a bearing of N 90 deg. 00 min. 00 sec. W and a distance of 422.01 feet to the beginning of a 37 foot strip.”

This statement begins the body of a centerline description for a strip of land parallel with the centerline of a highway. The first dialog box contains a list to select the corner of the section or quarter section where the description begins. The next dialog box is a key-in for the section number. Then a dialog box with a list to select the direction traveled. The fourth dialog box contains a list to select the side of the section traveled on. The next dialog box is a key-in for the section number. Another is a key-in for highway name. The last is a key-in for the width of the strip.

Body\Lines\CL Multi Widths

“This point is also the beginning of a 37 foot strip.”

This statement describes a change in widths of a continuous strip.

Body\Lines\End of Strip

“Thence N 90 deg. 00 min. 00 sec. W a distance of 422.01 feet to the end of the 37 foot strip.”

Body\Lines\Alongline

“Thence on a bearing of N 90 deg. 00 min. 00 sec. W along section line a distance of 422.01 feet.”

A dialog box appears with a request to “Insert Reference Line” (a section line, Senior property line, Riparian boundary, or right-of-way line) that the course is to proceed along.

CADD Standards

Curve Phrases

Body\curve\CrvTangent

“to the beginning of a tangent curve, concave (right) northwesterly having a radius of 899.50 feet. Thence northeasterly along said curve 113.23 feet through a central angle of 07 deg. 12 min. 45 sec. to the end of the curve.”

Insert the “Body\Line\BegCrv Line” before this statement. A dialog box that contains a list to select the direction of the concavity of the curve will appear. Next a dialog box with a list to select the direction of travel along the curve will appear. The library editor reads the arc distance and delta angle of the curve data stored in GEOPAK.

Body\curve\NonTanCrv

“a distance of 1095.07 feet. Thence northwesterly along said curve 1990.55 feet through a central angle of 104 deg. 08 min. 57 sec.”

Insert the “Body\Lines\BegCrv” Line (reads the data from the non-tangent course, before the curve) and “Body\Lines\ToNonTanCrv” (reads the data concerning the bearing of the radius) before this curve statement.

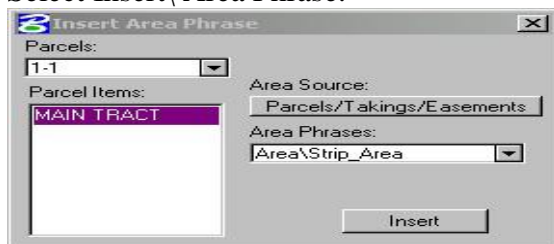
The complete statement for the non-tangent curve should read as follows:

“Thence N 90 deg. 00 min. 00 sec. W a distance of 422.01 feet to a point on a non-tangent curve concave (right), northerly, the radius point of which bears N 90 deg. 00 min. 00 sec.

W. a distance of 1095.07 feet. Thence northwesterly along said curve 1990.55 feet through a central angle of 104 deg. 08 min. 57 sec.”

Area Phrase

Select Insert\ Area Phrase.



A dialog box appears with a pull down list of all the parcels stored in GEOPAK. A pull down is also available for the “Area Source.” this is the fractional areas of a parcel. The parcels must be stored previously with fractional parts. The next pull down on the same dialog box is “Area Phrases.” The choices in here are “Area\Strip Area” and “Area\Parcel”. The editor will end this application with “End of description.” on a separate line.

Area\Strip Area

The Editor will print out “Said strip is shown on the plat as parcel.” a dialog box will appear to type in the parcel name, hit OK and the Editor reads the GEOPAK area data for this particular parcel and finishes the area portion of the description.

CADD Standards

Area\Parcel

This selection will print out the phrase “Said parcel” rather than “Said strip”.

Temp Easement

This statement is used if the parcel is temporary construction easement.

“It is a condition of this easement that it shall not be filed for record and that all rights conveyed to the state of North Dakota and North Dakota Department of Transportation by this instrument shall terminate upon completion of construction of said project, or in five years from the date of conveyance, whichever comes first.”

Closing Phrase

This statement is required at the end of the legal description. Select “Closing” then hit “Insert”, the editor will type in “The legal description was prepared by”. A dialog box will appear and on the top bar are the words “Insert name” this refers to the name of the person writing the legal description.

Select “Insert\Text Phrase\Text\Closing” the Editor will print out the following statement automatically, “The legal description was prepared by”. At this point a dialog box appears to key-in the name of the person creating the legal description. Hit OK, the Editor will complete the closing portion of the legal description.

Parcel Owner’s Name Phrase

To create a list of owners’ names and addresses on a project select “Parcel Owner’s Name Phrase” folder, found in the “Insert” pull down. A dialog box appears, the phrase at the top of the box says “Insert Owner’s Name Phrase”. A pull down is available to select a parcel. The owner’s name and address, of the selected parcel, will in the window under “Owner’s Names”. Hit insert and the phrase “Parcel No.” is printed, then a dialog box appears, with a key-in, to insert the parcel number. After hitting the “OK” button, the Name and address of the owner will print out.

CADD Standards

4.12 Survey Alignment Data Sheets

Feb 2009

Survey Alignment Data Sheets (080LO_###_SDL.dgn) are plan sheets used to communicate alignment data and points for topographical features such as curb radii and Manholes. In this process, electronic text files are created that can be imported into survey equipment and corresponding paper documents are created. Surveyors should not have to key in this information. This process involves:

1. Storing the alignments and points into cogo.
2. Drawing and labeling the alignments and points.
3. Creating and placing a coordinate table.
4. Exporting the alignments and points.

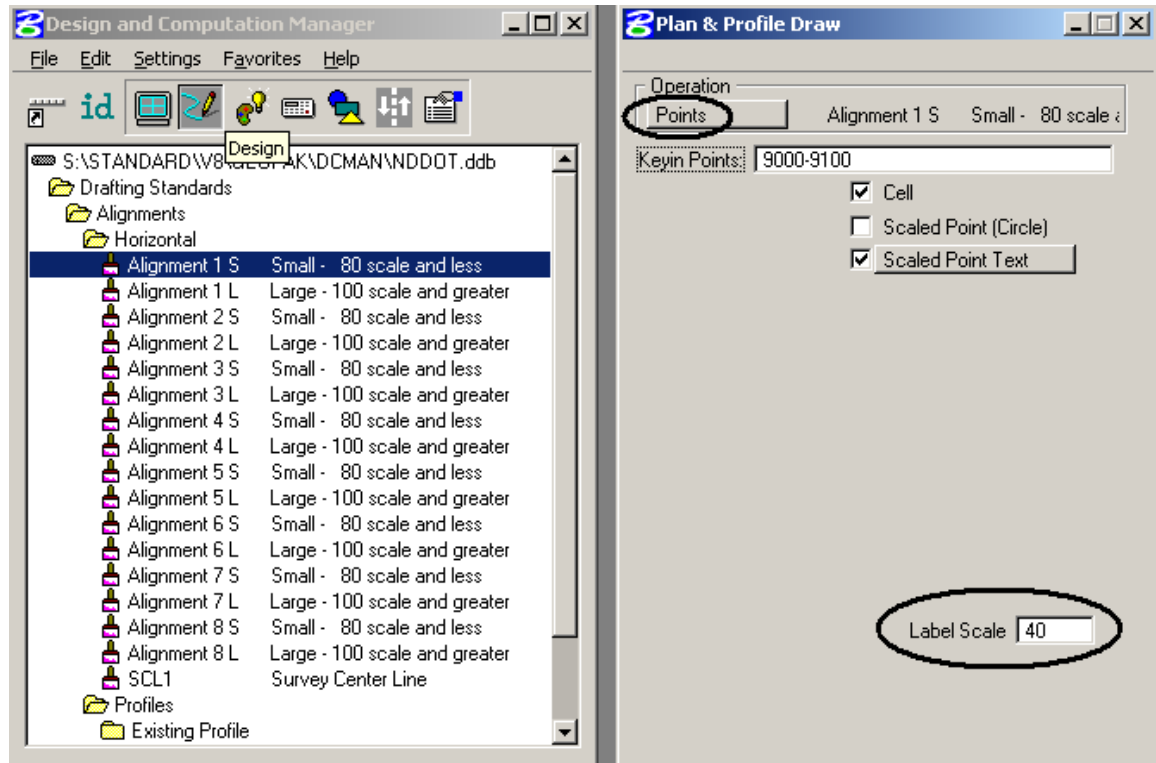
This section of the manual will give an overview of the process and highlight a few steps. This section will not provide comprehensive instructions. For additional comprehensive instructions for tasks such as storing an alignment see the GEOPAK help files.

1. Storing the alignments and points into cogo.
 - a. Be careful not to redefine important points. If “Redefinition of Elements” is on, you will be able to rewrite existing points. If it is off, you will only be able to create new points. Within Coordinate Geometry, use Navigator to find point ranges not used. Alignments created by design should use points within the range 8000-8999. Design topographical points should stay within the range 9000-9999. See [Section 4.2.2](#).
 - b. Temporary Cogo Visualization is recommended. Use the D&C Manager for the final symbology displayed in the plans.
 - c. Design topographical points should be stored with the cell “ADP”. You can leave the cell scale blank. You can set the scale later when it is drawn by the D&C Manager. If the “Auto Increment” option is turned on, the “Point Name” will be incremented after a point is stored into cogo.
 - d. A system of point ranges should be developed for each cut sheet. Try to create points in a logical sequence and leave extra numbers between point ranges in case revisions or additions are needed. Example: sheet 1 uses points 9000-9043, sheet 2 uses points 9100-9153, sheet 3 uses points 9200-9241, the point range 9044-9099 is not used unless revisions to sheet 1 are required and the point range 9154-9199 is not used unless revisions to sheet 2 are required.

The screenshot shows the 'Store Point' dialog box. The 'Point Name' field contains '9008'. The 'Auto Increment' checkbox is checked. The 'Coordinates' section has 'Northing' at '1146880.5513113' and 'Easting' at '2148051.9915831', with a 'DP' button next to the Easting field. Below the coordinates are fields for 'Station', 'Elevation', 'PCode', 'Point Cell' (set to 'ADP'), 'Scale', 'Feature', and 'Description'. The 'Store Point' button is located at the bottom right of the dialog.

CADD Standards

2. Drawing and labeling the alignments and points
 - a. Alignment Data Points (used for design topographical features) should be drawn in DS_Align.dgn and referenced into the 080LO_###_SDL.dgn sheets.
 - b. Alignment Data Points are drawn from the Horizontal Alignment items in the NDDOT Standard D&C Manager (S:\STANDARD\XM\GEOPAK\DCMAN\NDDOT.ddb). There are 8 alignment symbologies. Each alignment can be used for a different point level and point annotation level.

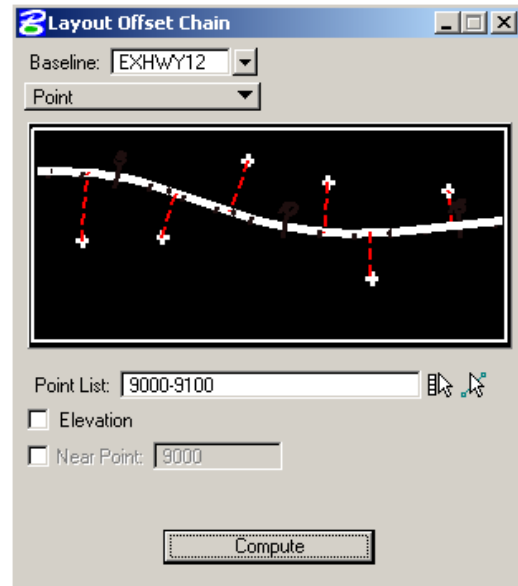


- c. Set the “Label Scale” before you type in the point range that you want to draw. The options to draw “Cell” and “Scale Point Text” should be on by default.
3. Creating and Placing a Coordinate Table
 - a. There are two main ways of Creating and Placing a Coordinate Table
 - i. Cogo and a text editor can be used to create the Coordinate Table
 - ii. Cogo and the “Place Coordinate Table” tool can be used to create the Coordinate Table. This is the recommended method.

CADD Standards

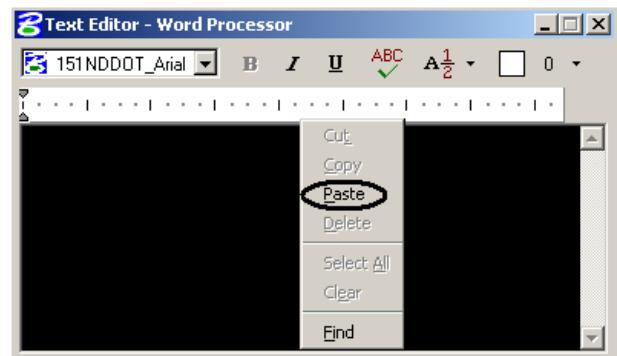
b. To create a Coordinate Table using Cogo and a text editor:

- i. Open Cogo. From Cogo's main pull down menu select "Element>Chain>Layout offsets".
- ii. Select the "Baseline" for the stationing and offsets
- iii. Set the option to "Point"
- iv. Provide a "Point List"
- v. Turn off the "Elevation" option if elevations are not stored with points. Turn off "Near Point" if projections are not needed.



- vi. Select the Compute button. Cogo will calculate coordinate information.
- vii. Create a cogo output file by selecting "File>File Utility" from cogo's pull down menu. Set the option to "Output" and provide an "Output File" name. Note the GPK number will be appended to the name and the extension will be ".ond" if ND was used as the operator code. Example if "yyy" was specified as the "Output file" and the GPK number was 001 then the output file would be named "yyy001.ond".
- viii. Use a text editor to edit and copy the desired information.

- ix. Coordinate Data can be placed into sheet drawings using the "Cut_Sheets_Design.stg", "Annotations" group and the "Note (07)" component. Using the MicroStation "Place Text" tool, right click in the "Text Editor" text entry area. A popup menu should appear. Select "Paste".



- x. Format and clean up text as needed and place it into the drawing.

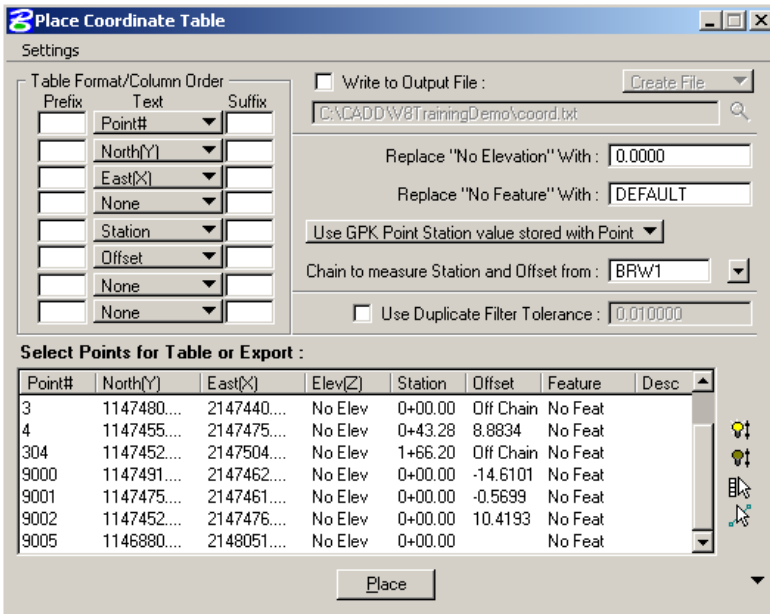
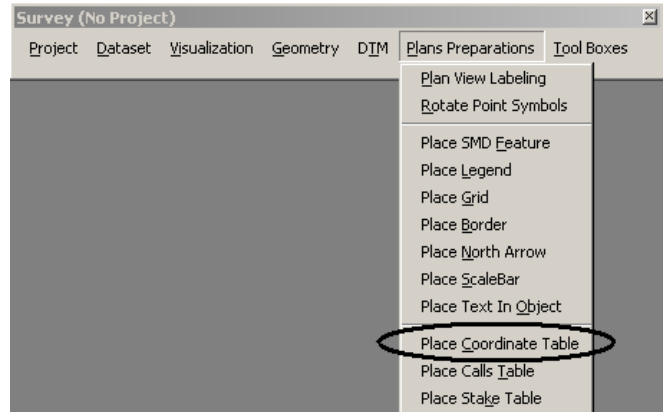
CADD Standards

c. To create a Coordinate Table using Cogo and the “Place Coordinate Table” tool.

i. Activate Cogo and Select your GPK – Job Number.

ii. The “Place Coordinate Table” tool is in GEOPAK Survey. Select “Plans Preparations>Place Coordinate Table” to load the “Place Coordinate Table” tool. A survey project does not need to be set up.

iii. The “Place Coordinate Table” should open. Load the NDDOT CADD Standard symbology settings by selecting “Settings>Open” from the “Place Coordinate Table” dialog box.



The settings files are located at
C:\Program Files\Bentley\GEOPAK\bin\.

Pick the appropriate settings file.

“nndot040.set” is for 40 scale

“nndot060.set” is for 60 scale

“nndot080.set” is for 80 scale

“nndot100.set” is for 100 scale

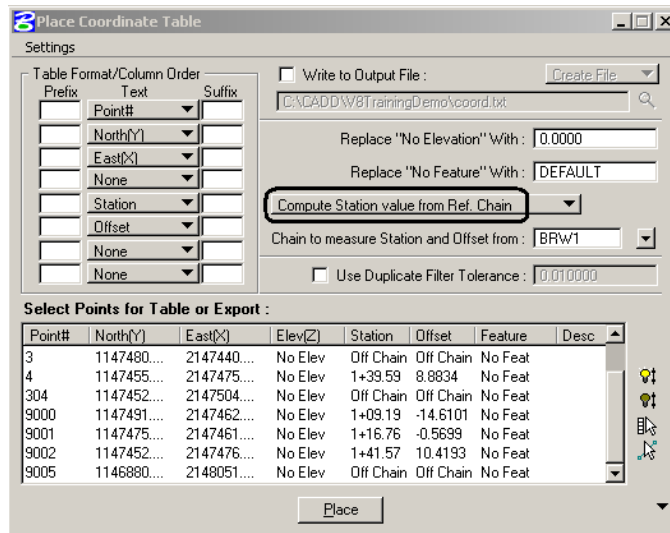
“nndot200.set” is for 200 scale

These settings files can be copied from
S:\STANDARD\XM\GEOPAK\bin

Note: the settings files don’t always set the appropriate levels for the coordinate table. This is a know bug with GEOPAK. The levels may have to be corrected manually. The text is intended to be place on level “sht Text 2” and the table lines should be on level “sht Lines 2”

CADD Standards

1. The default table is set up for the fields; Point Number, Northing, Easting, Station, and Offset. If additional fields such as Elevation are needed, use the “Table Format/Column Order” area of the dialog box to enable additional fields.
2. Set Stationing option to “Compute Station value from Ref. Chain”.



3. Select the desired points.
 4. Select the “Place” button and place a data point to define the upper left corner of the table.
4. Exporting the alignments and points
- a. Giving field personnel electronic output files of points and alignments is NOT the correct method of exporting design data into the field. GEOPAK output files (*.ond) can not be directly imported into survey equipments. GEOPAK Points and Alignments should be exported to files that can be directly imported by survey equipment. Points are exported to ASCII files (*.asc). Alignments and Profiles are exported to “Trimble DC” files (*.dc).
 - b. To export points from GEOPAK
 - i. Open cogo for the applicable gpk – job.
 - ii. From the Cogo dialog box, select “File>Export>ASCII Points”

CADD Standards

- iii. The “Export GPK Points to ASCII Coordinate File” dialog box should open. Clear all prefixes from the “Output Format”. A comma (,) should be used as a suffix for all fields except the last one. Example, if elevation is your last field, it should not have a suffix.

Point#	North(Y)	East(X)	Elev(Z)	Station	Offset	Feature	Desc
1	171735.0438	2695287.3239	No Elev	0+00.00	-31.7034	No Feat	CURB
2	172060.2774	2695597.1225	No Elev	0+00.00	20.1322	No Feat	HELLO
3	172606.0865	2695578.3237	No Elev	9+57.23	Off Chain	No Feat	HELLO
100	172080.5848	2694802.4085	No Elev	0+00.00	771.6655	No Feat	HELLO
101	172026.1824	2695364.7855	No Elev	0+00.00	-188.662E	No Feat	HELLO
102	172032.0814	2695368.0628	No Elev	0+00.00	-188.104E	No Feat	HELLO
103	172185.4570	2695230.7136	No Elev	0+00.00	-289.1532	No Feat	HELLO

- iv. Point#, North(Y), East(X) and Elev (Z) are the main fields imported into survey equipment. The Station and Offset Fields are not usually used in files to be imported into survey equipment. Station and Offset Fields are used in coordinate tables that printed in the plans.
 - v. The “Include Header” option should be turned off.
 - vi. Select the points to export to the survey file and select the “Apply button” to create the file.
 - vii. The survey ASCII file can be reviewed with a text editor to insure it was created correctly.
- c. To export alignments and profiles from GEOPAK:
- i. Open cogo for the applicable gpk – job.
 - ii. From the Cogo dialog box, select “File>Export>Alignments and Profiles”.

- iii. The “Export Alignments and Profiles” dialog box should open.
- iv. Set the “Export Format” to Trimble DC. Set the Version to 7.5. Set the Foot to international (“Int’l Foot”).

CADD Standards

- v. Select the appropriate Chain and Profile. You will have to create a separate “dc” file for each alignment.
- vi. The “Output File” should have a “dc” extension. It will be written to your working directory. Select the “Apply” button to create the file.
- vii. The “dc” file could be viewed with a text editor. However the format is complex and it will probably not be practical to review without additional Trimble software.

CADD Standards

Digital InterPlot (DIP)

5.1 InterPlot Pentables

Oct 2008

Specific pen tables need to be used in order to change appearance of MicroStation drawings. The following table lists the standard pen tables and its function. These pen tables are located in the s:\standard\XM\Iplot\ directory. The default pen table is NDDOT_PE.pen.

Pen Table Name	MicroStation Function
NDDOT_Black.pen	Prints in black and white Allows PE electronic distribution note to be printed
NDDOT_Color.pen	Prints in Color Allows PE electronic distribution note to be printed
NDDOT_PE.pen	Prints in black and white Prevents PE electronic distribution note from being printed

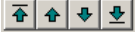
Unfortunately, pen tables don't work with Microsoft Office documents or simple raster documents (jpg or tif). That is why separate versions of the electronic plans are needed for PE stamped documents and another version for electronic distribution. Example, if you are working on plan notes, you will have to print a version of the notes that includes the PE electronic distribution statement and one that doesn't have the PE statement to the InterPlot Organizer.

CADD Standards

5.2 Adding Files to the Digital InterPlot Organizer

Feb 2009


Procedures for Designers (not Lead Designers)

1. Launch Digital InterPlot Organizer.
2. Choose Create a new plot set from files you select from the Welcome to InterPlot Organizer dialog box and press OK. If the Welcome box does not open, click on “File>Create Plots” from the menu bar.
3. Click the Add button.
4. Navigate to the project directory where your plan sheets are located.
5. Click on the Files of Type pull-down and choose All Files *.*.
6. Click on the MicroStation plan sheet files and the electronic versions of the plan sheets that you want to add. You can select multiple files by holding down the Ctrl or Shift key.
7. When you have all of the plan sheets that you want to add highlighted, click the Open button.
8. If this is for the final set of plans, add any Standard Drawings that you may need. The Standard Drawings can be found at R:\SUPPORT\DESSTD. Add these files the same way you would add any other MicroStation files.
9. When there is more than one plan sheet within a file, Digital InterPlot will add a sequential number to the end of the plot name for each additional plan sheet. These sheets should be renamed to the correct file name (see [Section 2.2](#) and [Appendix A](#).) Before renaming the files, make sure the files are in the correct order. This can be done by selecting the files and clicking on “File>Print Preview” on the menu bar. Click through the preview and check the order of the sheets. If they are not in the correct order, put them in order by using the Move buttons  on the tool bar. Now, the sheets can be renamed by doing one of the following:
 - a. Rename one plot sheet at a time
 - i. Right click on each plot sheet and choose Rename.
 - ii. Change the name to the correct name and press Enter.
 - b. Rename multiple plot sheets at once
 - iii. Select all the plot sheets that are from the same original file.

<u>Original File Name</u>	<u>Plot Sheet</u>
200XS_001_Lxsec.dgn	200XS_001_Lxsec
	200XS_001_Lxsec1
	200XS_001_Lxsec2
	200XS_001_Lxsec3

- iv. Right click on one of the files and choose Rename.
- v. Put a check in the Number Plots box and put the starting page number in the Start At box and a 3 in the Field Width box.
- vi. Put a check in the Add Prefix box and enter the section number with the two letter abbreviation followed by “_”. Ex. 200XS_

CADD Standards

- vii. Put a check in the Add Suffix box and the suffix modifier preceded by “_”. Ex. _Lxsec
 - viii. Choose Selected plots in the Apply to box and press OK.
- 10. Sort the files into the correct order by clicking on the Plot Name column heading. Each click on Plot Name will alternate between ascending and descending.
- 11. Click “File>Save As” on the menu bar and save the plot set into a working directory, in case you need to make any changes later. The plot sets should be saved in the corresponding DIP folder under the project directory. For example, you are in Bridge and are working on PS&E plans. First you would navigate to the PS_E folder under the DIP directory. Next create a new Bridge folder by clicking on the Create New Folder  button. Double click on the newly created Bridge folder. Type “Bridge_PSE01” in the File name field and click the Save button.
- 12. Export the plot files into the correct DIP folder so the Lead Designer can add them to their plot set.
 - a. Select all of the plot files.
 - b. Click on “File>Export Plots” on the menu bar.
 - c. Navigate to the corresponding DIP folder under the project directory by double clicking on the folders or using the plus signs next to the folders.
Ex. R:\project\40060015.017\DIP\PS_E - when putting the PS&E plans together
 - d. Click the OK button to finish the Export process.
- 13. Contact the Lead Designer and let them know your files are ready for them to add to their plot set.
- 14. Give the Lead Designer a hard copy of your plan sheets (required for final plans, addendums, and change orders only.) See the Hard copy format section below for more information on creating hard copy plans.

Procedures for Lead Designers

- 1. The procedures for the Lead Designers are the same as shown in steps 1-11 of the Procedures for Designers (not Lead Designers) section above.
- 2. Add the plot files that were exported by the Designers. They should be located in the corresponding DIP folder under the project directory (Ex. R:\project\40060015.017\DIP\Final - when putting the final set of plans together.) These files will have a *.i, *.dpm, or *.rpm file extension.
- 3. Sort the files into the correct order by clicking on the Plot Name column heading. Each click on Plot Name will alternate between ascending and descending.
- 4. Click “File>Save As” on the menu bar and save the plot set into the appropriate directory. The plot sets should be saved in the corresponding DIP folder under the project directory. For example, you are working on a final set of plans. Navigate to the Final folder under the DIP directory. Type the filename in the Name field (see [Section 2.9](#) for file naming conventions.)

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Procedures for Addendums (after authorization – prior to bid opening)

1. Addendum sheets have special requirements.
 - a. Add the words “Sheet Added” with the addendum date to the plan sheet.
 - b. Change the revision_date tag on each plan sheet with the date of the addendum.
2. Make revisions to the existing plan sheets. Any changes that are made should be made to the original plan sheet file.
 - a. Change the files so that they are not read-only. They should have been made read-only after they were sealed for the final set of plans.
 - b. Make the changes to the plan sheet.
 - c. Add the word “Revised” with the addendum date to the plan sheet. If the sheet was previously revised as an addendum, keep the original revised note and add another one (example: Revised 1-12-09, Revised 1-20-09).
 - d. Change the revision_date tag on each plan sheet with the date of the addendum.
3. The plan sheets will be assembled as shown in the Procedures for Designers (not Lead Designers) and Procedures for Lead Designers sections above. Exception: Only the sheets that have been revised or added to the plans will be included in the plot set.
4. Save the plot set in Addendums folder under the DIP directory.
Ex. R:\project\40060015.017\DIP\Addendums\BRS-4-060(017)015_Addendum1_Black_ED.ips

Procedures for Change Orders (after bid opening)

See [Section 7.4](#) for information on where and how the change order plan sheet files will be stored.

1. Remember to fill in the revision_date tag on each plan sheet with the date of the change order.
2. Make revisions to the existing plan sheets. Any changes that are made shall not be made to the original plan sheet file (see [Section 7.4](#) for more information.)
Remember to fill in the revision_date tag on each plan sheet with the date of the change order.
3. The plan sheets will be assembled as shown in the Procedures for Designers (not Lead Designers) and Procedures for Lead Designers sections above. Exception: Only the sheets that have been revised or added to the plans will be included in the plot set.
4. Save the plot set in Plan_Rev folder under the DIP directory.
Ex. R:\project\40060015.017\DIP\Plan_Rev\BRS-4-060(017)015_Plan_Rev1_Black_ED.ips

CADD Standards

5.3 Plan Production

Oct 2008

Because of the way Digital InterPlot works, we are not able to add and remove the electronic distribution statement from plan sheets that are not made in MicroStation.

Therefore you would need two electronic versions of these plan sheets: one with the statement and without the statement. This also means that you would have to maintain two plot sets: one plot set containing the files with the statement and one containing the files without the statement (Preliminary and PS&E plans will not have the statement.)

This may become cumbersome when you have sheets that change and you now have to make sure and update both plot sets. Therefore, what we recommend is to only have one plot set – the one containing the sheets that have the electronic distribution statement. The following sections explain how this can be accomplished.

Hard copy format

It's a good idea to quickly make a test PDF of the plans before you have the hard copies sealed. This will ensure that everything will look correctly in the electronic copy of the plans (see the Electronic Copy sections below.)

1. Print the following plan sheets directly from the program it was created in:
 - a. For the Estimate of Quantities plan sheet, print a hard copy from the PDF that is generated from the Mainframe. See [Section 7.5](#) for instructions on how to create a PDF for the Estimate of Quantities plan sheet.
 - i. Open the PDF file for the Estimate of Quantities sheet.
 - ii. Click on the Print button on the tool bar.
 - iii. Choose the correct printer in the Printer Name box.
 - iv. In the Page Handling section of the dialog box, set the Page Scaling to Fit to page and put a check in the Auto-Rotate and Center & the Choose Paper Source by PDF page size boxes.
 - v. Click the OK button.
 - b. For the Table of Contents, Notes, and Traffic Control Devices List, you would use the Print Hard Copy button.
 - c. For other windows based programs, you would use File => Print on the menu bar.
 - d. For MicroStation files that have only one plan sheet:
 - i. Click on File => IPLOT on the menu bar.
 - ii. Make sure the correct printer is shown in the Printer field. If not, choose the correct printer and click on the Exit button. Go back to File => IPLOT on the menu bar to restart IPLOT. This will insure that all the correct settings will be used for that printer. Once the correct printer has been selected it will stay as the default printer.
 - iii. Click the Plot button.

CADD Standards

- e. For MicroStation files that have more than one plan sheet:
 - i. Place a fence around the plan sheet that you want to print by snapping to the small white dots at the corners of the border. You do not need to place a fence if you only have one plan sheet in the file.
 - ii. Click on File => IPLOT on the menu bar.
 - iii. Make sure the correct printer is shown in the Printer field. If not, choose the correct printer and click on the Exit button. Go back to File => IPLOT on the menu bar to restart IPLOT. This will insure that all the correct settings will be used for that printer. Once the correct printer has been selected it will stay as the default printer.
 - iv. Click the Plot button.
- f. For batch plotting MicroStation files:
 - i. Launch InterPlot Organizer.
 - ii. Open your plot set if you've already started creating it. If you have not created a plot set, you can start from a blank one.
 - iii. Select the plot sheets that you would like to print (hold down Ctrl or Shift to select multiple sheets.) If you started from a blank plot set, add the plan sheets you want to print by clicking on File => Create Plots on the menu bar. Click the Add button and navigate to the location of your plan sheets. Select the files you want to print, click Open, and then click OK. Select all the plot sheets.
 - iv. Check to make sure that "nddot_pe.pen" is listed in the Design Script column next to each sheet you want to print. If something else is shown in this column, click Edit => Properties on the menu bar. Click on the General tab and choose Design Script in the Resymbolization file section of the dialog box. Click on Browse and select nddot_PE.pen. Click on Open and then click OK.
 - v. Click File => Print on the menu bar.
 - vi. Choose the correct printer and click OK.
- 2. Assemble the hard copies together and have a PE seal the plan sheets (required for final plans, addendums, or change orders only.)
- 3. Make all the MicroStation files and the non-MicroStation plan sheet files for this project read-only (required for final plans, addendums, or change orders only.) This will prevent anyone from accidentally making any changes to the files that could cause the electronic copies to be different than the hard.
 - a. Open Windows Explorer or double click on My Computer.
 - b. Navigate to the folder containing your plan sheets.
 - c. Select all the files to make read-only.
 - d. Click on File => Properties.
 - e. Put a check in the Read-only box on the General Tab.
 - f. Click the OK button.
 - g. You can also make the entire contents of a folder read-only by selecting the folder instead of the files.

CADD Standards

Electronic copy (Preliminary and PS&E plans)

1. Launch InterPlot Organizer.
2. Open the plot set that you created following the procedures outlined in [5.2 Adding](#) Files to the Digital InterPlot Organizer above. The file should be located under the corresponding folder of the DIP directory for your project.
3. Create a copy of the plans as a PDF.
 - a. Check to make sure that “nddot_pe.pen” is listed in the Design Script column for all the MicroStation plot sheets. If something else is shown in this column, follow these steps to change the pen table:
 - i. Click on Edit => Select => All Plots on the menu bar.
 - ii. Click on Edit => Properties on the menu bar.
 - iii. Select MicroStation and click the Properties button.
 - iv. Click on the General tab and choose Design Script in the Resymbolization file section of the dialog box.
 - v. Click on Browse and select nddot_PE.pen.
 - vi. Click on Open and then click OK twice.
 - b. Make sure that none of the plot sheets are selected by clicking on the white part of the screen.
 - c. Click on File => Export PDF on the menu bar.
 - d. Make sure All is selected in the Plot Range box.
 - e. Click on the PDF Format Configuration button.
 - f. Set the Resolution to 700 dpi on the Format Properties tab.
 - g. Set the Version Compatibility to Acrobat 6.0 and later.
 - h. Click the OK button.
 - i. If you want to look at the PDF after it is created, put a check in the Invoke PDF viewer when done box.
 - j. Click the Create PDF button.
 - k. Navigate to the corresponding folder in the DIP folder.
 - l. Type the file name in the File name field (see [Section 2.9.](#))
 - m. Click the Save button.
1. Electronic copy (Final, Addendums, and Change Orders)
2. If you are working on the final set of plans, obtain the Job Number from one of the Assistant Design Engineers:
 - a. Change the title sheet file so that it is not read-only.
 - b. Open the title sheet drawing in MicroStation.
 - c. Add the job number to the title sheet. Do not change anything else on the title sheet or it will have to be stamped and signed again.
 - d. Change the title sheet file back to read-only.
3. Launch InterPlot Organizer.
4. Open the plot set that you created following the procedures outlined in the [5.2 Adding](#) Files to the Digital InterPlot Organizer above. The file should be located under the corresponding folder of the DIP directory for your project.

CADD Standards

5. First, we will create a black & white copy of the plans as a PDF.
 - a. Check to make sure that “nddot_black.pen” is listed in the Design Script column for all the MicroStation plot sheets. If something else is shown in this column, follow these steps to change the pen table:
 - i. Click on Edit => Select => All Plots on the menu bar.
 - ii. Click on Edit => Properties on the menu bar.
 - iii. Select MicroStation and click the Properties button.
 - iv. Click on the General tab and choose Design Script in the Resymbolization file section of the dialog box.
 - v. Click on Browse and select nddot_black.pen.
 - vi. Click on Open and then click OK twice.
 - b. Make sure that none of the plot sheets are selected by clicking on the white part of the screen.
 - c. Click on File => Export PDF on the menu bar.
 - d. Make sure All is selected in the Plot Range box.
 - e. Click on the PDF Format Configuration button.
 - f. Set the Resolution to 700 dpi on the Format Properties tab.
 - g. Set the Version Compatibility to Acrobat 6.0 and later.
 - h. Click the OK button.
 - i. If you want to look at the PDF after it is created, put a check in the Invoke PDF viewer when done box.
 - j. Click the Create PDF button.
 - k. Navigate to the corresponding folder in the DIP folder.
 - l. Type the file name in the File name field (see [Section 2.9.](#))
 - m. Click the Save button.
6. Second, we will create a color copy of the plans as a PDF.
 - a. Check to make sure that “nddot_color.pen” is listed in the Design Script column for all the MicroStation plot sheets. If something else is shown in this column, follow the same procedures in step 5 above to change the pen table.
 - b. See the procedures shown in step 5 to see how to finish creating the PDF document.

CADD Standards

Axiom

6.1 Axiom Title Block Manager

July 2006

The Axiom Title Block Manager (TBM) tool is used to edit (manage) MicroStation title blocks and tags. This tool allows multiple title blocks and tags from multiple drawings to be edited from one spreadsheet.

1. General Title Block Manager Setup
 - a. Only the Central Office has access to this tool. The tool “Title Block Administrator” should be available within MicroStation under the Axiom pull down menu.
 - b. TBM will work with a blank Microsoft Excel spreadsheet. Users can save a blank spread sheet to their project directory before they start TMB or this can be created while running TBM (see step 2c). A preformatted spreadsheet was previously used in early TBM test and demonstrations. However, a couple complications with using a preformatted spread sheet were discovered. Presently, using a preformatted spreadsheet is not recommended.
 - c. The standard sheet cells published after April 2005 need to be used. These cells have tags attached. The old standard sheet cells published before April 2005 don’t have tags for title blocks.
 - d. Don’t Drop your Sheet Cells. Your Tags and Title Blocks will have to be recreated. Dropping cells should be avoided, because it takes time and can be complicated.
 - e. This section doesn’t discuss TBM in detail. For more information on TBM see Axiom’s User Guides;
m:\apps\production\design\axiomV8\tbadmin\tbaminv8.pdf
2. Update Title Block Manager Excel Spreadsheet from Selected Drawings
 - a. In Title Block Administrator’s main dialog box, Select Action: “Update database from selected design files.”
 - b. Click the <Select> button to the right of the “Design Files:” field. The dialog that opens allows you to select a batch of files for processing. Select the files that you want to manage. You need “write access” to these files and they should all use standard sheet cells. After selecting the files that you want to manage, click <OK> to return to the Title Block Administrator main dialog.
 - c. Select your database (Excel Spreadsheet). This could be an empty spread sheet that you created before you started TBM or you can have TBM create one for you now by typing in a path and file name. Remember Excel files have an xls extension. Also note that spreadsheet can’t be open while you run TBM.
 - d. Select a name and location for your report file. Example (c:\temp\TBM.rep). This file only documents what you have done.

CADD Standards

- e. This step is optional. If you want to work with just one type of tag set within one spread sheet, the specific tag set or sets can be specified in the TBM settings. Example, if you only want to edit just DIP tags in one spread sheet, you would select “Settings>Change Settings” from the TBM pull down menu. Then you would type “bordercell” in the “Tag sets to process” field. Note, the character “*” can be used in the “Tag sets to process” field. The “*” character means it will process all tags within the drawing.
 - f. CAUTION, if you process multiple tag sets at one time, your spread sheet may imply false tag relationships. Example, you may need to process a cell with the tag sets named “bordercell” and “titleblock”. The tag named “bridge” is part of the tag set named “bordercell”. However your spread sheet will contain a cell for the tag named “bridge” in the tag set named “titleblock”. This is a false relationship. Nothing will happen if you fill it in because it doesn’t exist within your drawing. These false fields are not important if you remember that they are not used. You must be aware of which tags belong to which tag set.
 - g. Click the Start button to begin the update. At the end of processing, you will see summary totals. Click <OK>.
 - h. Now you can select <Display Report> to see a summary of what was done.
 - i. Open the Excel by pressing the <Edit Database> button to see what was added.
3. Update Selected Drawings from Title Block Manager Spreadsheet
- a. If you just completed step 2, your file list is still there as <Edited File List>. If not, use the <Edit List> dialog to select your files.
 - b. Open database by clicking on the <Edit Database> button. You will see all of your design files represented one row per tag set. Note most sheet cells have multiple tag sets.
 - c. Edit the data fields as needed. The data fields have been grouped by tag sets. You may have to sort on the tag set name in order to edit groups of data fields. Note, page and section numbers should not use preceding zeros – place holding zeros in the title blocks.
 - d. Save and close the spreadsheet.
 - e. In MicroStation - Axiom, change the “Action:” to <Update selected design files from Database>. Make sure that your TBM spreadsheet is selected and you have specified a report file.
 - f. Now click <Start> to begin the update. At the end, you will see summary totals.
 - g. Click <OK> to those totals.
 - h. Open the MicroStation files to see your changes.

CADD Standards

6.2 Tag Index

October 2005

This section is an index for sheet cell tag sets.

Tag Set	Tags	Description
bridge	bridge_engineer	
	bridge_engineer_date	
	Bridge_number-page	
	clear_height	
	clear_span	
	county	
	design_loading	
	drawing_code	
	engineers_initials	
	future_wearing_surface	
	Maximum_fill	
	project	
	quantity_desc_a	
	quantity_desc_b	
	quantity_desc_c	
	quantity_desc_d	
	quantity_unit_a	
	quantity_unit_b	
	quantity_unit_c	
	quantity_unit_d	
	quantity_value_a	
	quantity_value_b	
	quantity_value_c	
	quantity_value_d	
	standard_drawing_a	
	standard_drawing_b	
	station	
	title_a1	
	title_a2	
	title_b1	
	title_b2	
	title_c1	
	title_c2	
	title_c3	
ls_stamp	ls_date	
	ls_name	

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	ls_number	
pe_stamp	pe_date	
	pe_name	
	pe_number	
std_dwg	drawing_date	
	drawing_no	
survey	approved	
	approved_name_typed	
	basis_of_bearing	
	checked_by_ls	
	combination_factor	
	coord_assumed	
	coord_system	
	county	
	county_ground_coord	
	date_approved	
	date_ls_checked	
	date_plat_made	
	date_survey_completed	
	mile	
	parcel_line1	
	parcel_line2	
	plat_made_by	
	plat_number	
	project_number_bottom	
	project_number_top	
	scale_inch	
	scale_mark1	
	scale_mark2	
	scale_mark3	
	supplememt_to_plat_no	
	supplements	
titleblock	div-dist_or_consultant	
	page	
	pcn	
	project	
	section	
	tb_line1	
	tb_line2	
	tb_line3	

CADD Standards

	tb_line4	
	tb_line5	
	tb_line6	
	tb_line7	
	tb_line8	

CADD Standards

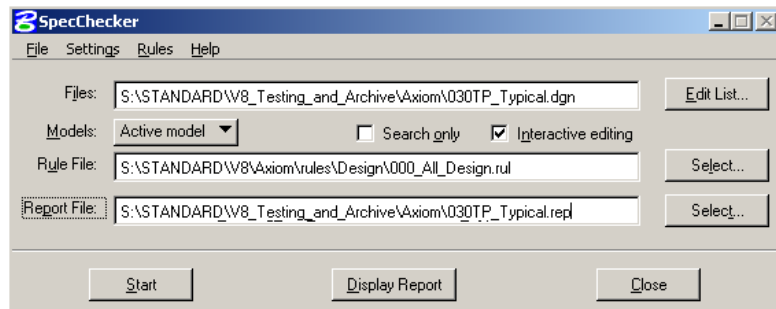
6.3 Axiom SpecChecker

Oct 2008

Axiom SpecChecker is a tool that reviews drawings for CADD standards compliance. Axiom SpecChecker is available to NDDOT Central Office users. Presently most District users don't have access to this tool. Consultants are not required to use this tool but they may be evaluated by it.

SpecChecker is activated from them main pull down menu; Axiom>SpecChecker for V8. The following dialog box should open.

The "Files;" field should default to the file in which SpecChecker was activated.



The "Edit List..." button can be used to change the file to be reviewed or a group of files can be selected.

SpecChecker uses a list of rules that represent the CADD standards. These rules are comprised of statements that "Reject" or "Accept" drawing elements. Most of the rule files use subroutines that call on additional rule files. The rule files are stored in s:\standard\XM\axiom\rules*.rul. The rule files were created from the same database that is used to create the "select settings – groups". The rule files are also structured using the same major headings that are in the group pull down shortcuts; Bridge, Design, Mapping, Materials, Photo, and Traffic.

The following is a list of the main rule files.

FileNames.rul	- used to review all drawings for standard file names.
All_Bridge.rul	- used to review all bridge drawings.
All_Design.rul	- used to review all Design drawings.
All_Photo.rul	- used to review all Survey & Photogrametry drawings.
All_Traffic.rul	- used to review all Traffic drawings.

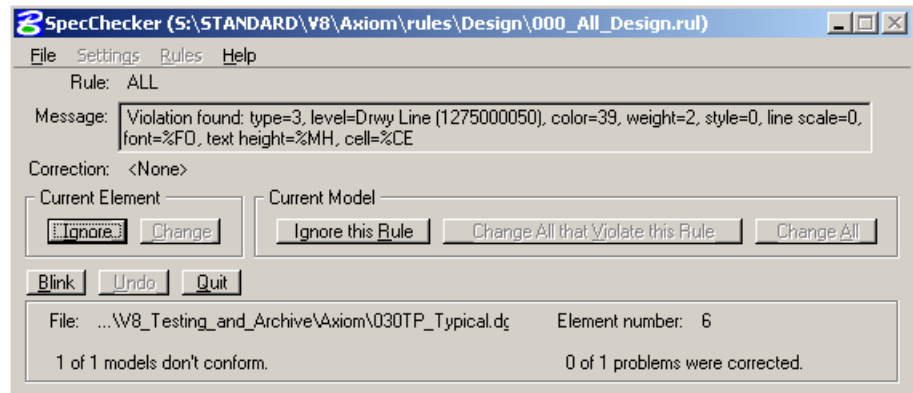
The "Report File;" field designates a location and a name for a text file – report of potential CADD Standards Violations.

The "Start" button starts the review process. The "Display Report" button displays the text report. The "Close" button closes the application.

If the "Interactive Editing" option is activated you can review the drawing elements that don't meet any "Accept" rules and have SpecChecker show (Blink) these elements. If the "Interactive Editing" option is turned off, only the report file of potential CADD standard violations will be created.

CADD Standards

A second dialog box will appear during the review process if the “Interactive Editing” option is turned on and a violation is found. A message detailing the drawing element will be displayed. If an attribute of a drawing element is not applicable, such as the “font” of a line, the attribute will display the variable name and not the value (example: font=%FO).



The “Blink” button is used to identify the drawing element that is a potential CADD standards violation. The “Blink” button will make the display of the element turn off and on.

A potential CADD standard can be skipped or ignored by using the “Ignore” button. The potential CADD standard violation will still be displayed in the report.

Correction rules for the NDDOT are presently not used. Users need to manually determine what attributes of drawing elements don’t meet SpecCheckers Rules.

SpecChecker doesn’t check all CADD standards. This is how SpecChecker has been set-up.

Linear elements are checked for the following.

- They must be used in a drawing with a standard name.
- They can’t be text, text node or dimension type of elements.
- The Level Number-Name must be standard.
- The Color must be standard.
- The Weight must be standard
- The Linestyle and Linestyle Scale must be standard.

Text elements are checked for the following.

- They must be used in a drawing with a standard name.
- They must be a text or text node type of element.
- The Level Number-Name must be standard.
- The Color must be standard.
- The Weight must be standard
- The Linestyle be standard.
- The font must be standard.
- The Text Height must be standard.

CADD Standards

Cell elements are checked for the following.

- They must be used in a drawing with a standard name.
- They must be a cell type of element.
- The cell name must be standard.
- The cell scale must be standard

Most Feature drawn on the standard dimension levels are passed.

The scale of the drawing is sometimes read from a cell in drawing. If a plan sheet cell (cell named plan*) is encountered, the scale of the drawing will be set from the scale of the plan sheet cell. There are a few requirements for the scale of the drawing to be read by SpecChecker.

1. A cell named with characters starting with “plan” must be used in the drawing. The cell can not be dropped.
2. Multiple plan* cells can be used but they must be the same scale.
3. A standard scale must be used. A standard scale is a scale that you could pick in the “select settings – groups”. Example, the scale of 1”=100’ will work with SpecChecker but the scale of 1”=103’ is not a choice in the groups and will not register with SpecChecker.

If a plan sheet cell is not used in a drawing, a default scale will have to be manually picked. Default scales have been set up for 40, 60, 80, 100, and 200 scales. The default scale is indicated in main rule file name (examples; All_Design_040.rul is for 40 scale and All_Design_200.rul is for 200 scale.

SpecChecker was intended to pass or allow everything drawn with “Select Settings – Groups”. However some element that should pass, don’t, and some elements that do pass, shouldn’t. The following is a list of SpecChecker deficiencies.

1. Some features drawn with GEOPAK have not been included in SpecChecker and will be flagged as a potential CADD Standard violation when tested.
2. The “Place Note” (text with an arrow leader) tool creates uses a cell without a name. This type of element will be flagged as a potential CADD Standards violation.
3. Grouped elements will also show as a cell without a name. These elements will be flagged as a potential CADD Standards violation.
4. Hatching and patterning are only passed if the “Associative Region Boundary” option is used.
5. Higher level numbers such as 4,000,000,000 will not be reported correctly in the SpecChecker “Message”. However the level name will show correctly.
6. Cells will not be reported with the correct level.
7. Potential violations will be counted twice in some total summary reports. The same potential violation may be counted once for non conforming symbology and another time for a not matching a standard name. This doesn’t occur for bridge drawings and some design cut sheets.

SpecChecker is automated but ultimately requires someone to review the flagged elements.

CADD Standards

6.4 Axiom FileRename and FileResequene (Custom Macros)

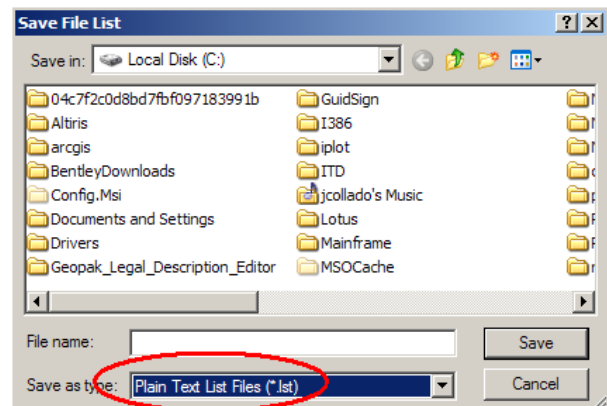
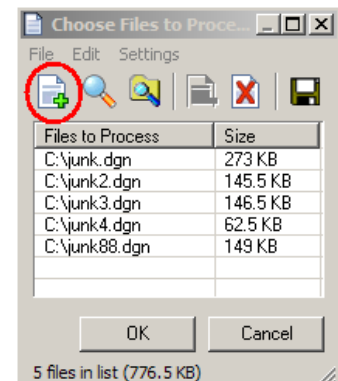
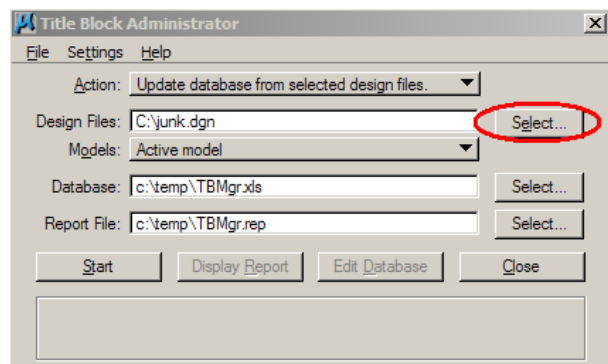
Oct 2008

The FileRename macro will add the section number and sequence (page) number to the front of your file name. You can only do one section at a time and the files must be sequential, but the files do not have to be MicroStation files. You can use this macro for all types of files.

In order to use the FileRename and FileResequene macros, a list of files names that you want to rename must be stored in an ASCII file with a “lis” extension. Axiom “Title Block Administrator” can be used to create this list.

Creating an ASCII list File

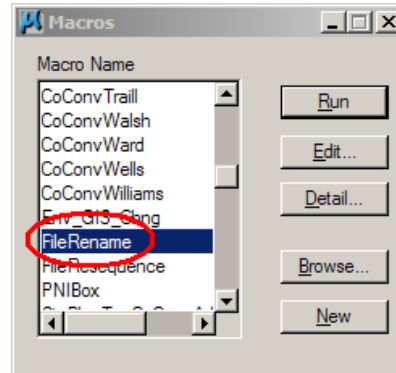
1. Open a MicroStation drawing file that is **not** going to be added to the list.
2. Click on “Axiom > Title Block Administrator” on the menu bar.
3. Click on the “Select” button.
4. Click the “Browse for files and add to list” button. Select the file that you want to be first in the sequence. Multiple files can be selected by holding down the control key while the files are selected. The order that files are selected is important because this influences the order drawings will be renamed. Select “Open” to add the files to the list.
5. When your list is complete, click the save button or select “File > Save File List” on the menu bar.
6. A “Save File List” dialog box should open. The “Save as type option” needs to be set to “Plain Text List Files (*.lst)”.
7. Type in a name for the file and save the file in your project directory.
8. Click OK to close the “Choose Files to Process” dialog box.
9. Close the Title Block Administrator dialog box.



CADD Standards

Running the FileRename Macro

1. An ASCII list file is needed before running this macro (See creating and ASCII list file). The files in the list should not be open because the macro will not be able to rename them while they are open.
2. Click “Utilities > Macro > MicroStation Basic” on the menu bar.
3. In the Macros dialog box scroll down to the FileRename macro. Click the Run button.
4. Choose the section number from the list and click OK.
5. Enter the starting sequence (page) number and click OK.
6. Locate the ASCII list file you previously saved (Creating an ASCII list file, step 7).
7. Click the OK button on the Information dialog box to finish the process.



If you have to add a file in the middle of a section, you can quickly renumber the files following the inserted file by using the FileResequene macro. The FileResequene macro will change the sequence (page) number of existing files. You can only do one section at a time and the files must be sequential, but the files do not have to be MicroStation files. You can use this macro for all types of files.

Running the FileResequene Macro

1. An ASCII list file is needed before running this macro (See creating and ASCII list file). You will only have to add the files that come after the file you added. The files in the list should not be open because the macro will not be able to rename them while they are open.
2. Click “Utilities > Macro > MicroStation Basic” on the menu bar.
3. In the Macros dialog box scroll down to the FileResequene macro.
4. Click the Run button.
5. Enter the sequence (page) number that comes after the file you inserted and click OK.
6. Locate the ASCII list file and click OK.
7. Click the OK button on the Information dialog box to finish the process.

CADD Standards

Other Standards and Procedures

7.1 As-built Plans (Record Drawings)

July 2007

The “Construction Records Manual” ([Section 7](#)) discusses what is to be included in As Built Plans. As-Built drawings can be hand drawn or created electronically. The following instructions for creating as-built drawings are recommendations. This section of the CADD Standards Manual elaborates on “how and where” to specifically include this information in the CADD files.

All as built information that is different than the information from Design will be kept in the As-built Folder located in the project directory (see [Section 2.1](#)). As-built plans will be assembled in the same manner that the Design Plans were assembled. If design details were documented in one drawing then referenced in cut sheets, then the as-built details should be documented in one drawing then referenced in cut sheets.

Example: A driveway was not built at the location shown in the design plans. Originally the driveway information was specifically drawn in the file

R:\project\80046083.017\DESIGN\design.dgn

then referenced into

R:\project\80046083.017\DESIGN\Sheets\pp_geelan1.dgn.

The person creating the as-built drawings should create new drawings named “design_AB.dgn and pp_ABgeelan1.dgn. Note that the file name uses a suffix modifier “AB”. [Section 2.2](#) discusses file naming requirements. As-built drawings are the only drawings where a suffix modifier is mandatory. All as-built drawings are to be named with a suffix modifier “AB”.

The as-built changes should only be made to the new files within the as-built folder. Include only the features that have changed from the original design. The as-built driveway would be drawn within R:\project\80046083.017\Asbuilt\design_AB.dgn and then referenced and clipped into R:\project\80046083.017\Asbuilt\Sheets\pp_ABgeelan1.dgn. The pp_ABgeelan1.dgn should reference the original drawing pp_geelan1.dgn. Remember to use a reference nest depth of “1” in order to reference the original sheet and all of its references.

Most as-built drawings reference the original design drawings. Referencing is usually preferred over copying because changes can be quickly identified and it is less redundant. However there are exceptions to referencing for as-builts.

Some as-built files need to be copied from the original design file and then edited in order work with GEOPAK. The GPK file and Cross Section files should be copied from the original design folder.

As-built drawings with extensive changes are another exception to referencing. Drawings that have many revisions can be copied and edited for simplicity. For example a detailed drawing of a Lift station may have many revisions. This drawing could be copied from the design folder into the as-built folder. Then the revisions could be made to the typical drawing without referencing.

CADD Standards

Remember to rename these copied drawings with the as-built “AB” suffix modifier.

The element symbology for as-built drawings should be the same as the symbology used for the design plans. Unique element symbology is desired in as-builts for the same reasons it is desirable in design plans. We want to be able to quickly identify features both in as-built and design plans. However all as-built drawings need to use “level symbology”. Traditional as-builts are black and white with the exception of the as-built information. As-built information should appear blue. When creating as-built drawings the ‘level symbology” for all design drawings should be set to color “0” (black and White) and the “level symbology” for all as-built drawings should be set to color “1” (blue). This symbology should produce a black, white and blue set of plans.

As-built plans shall be assembled in the same manner that the Design Plans are assembled except that the words “As-Built”, shall be placed directly under the project number in the upper right title block.

CADD Standards

7.2 Arc Internet Mapping Service

Oct 2008

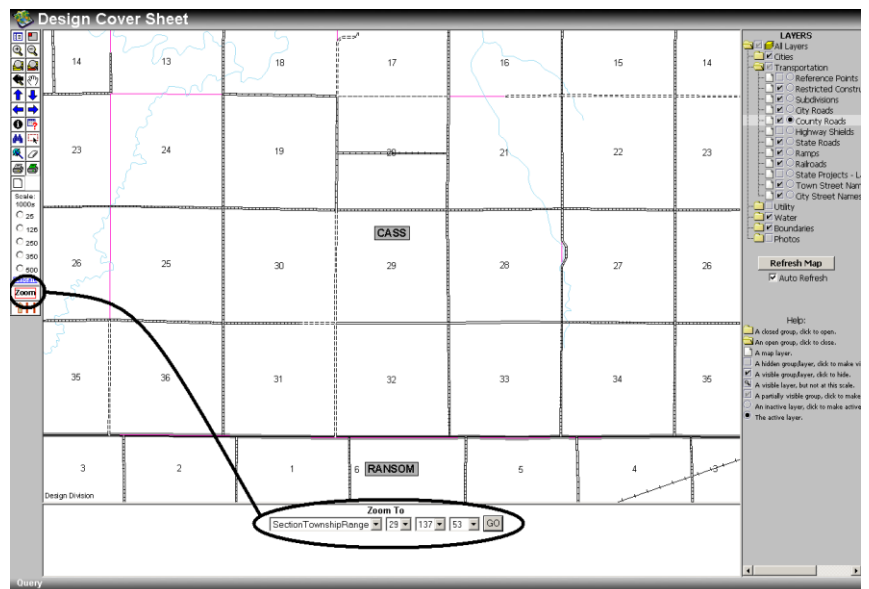
This tool is used to create maps for “Design Plan Title Sheets” and “Construction Haul Road Restriction Maps”. It can also be used for other Design Plan Sheets and Project Concept Report maps.

If you just want a simple county map, don’t use this ARC Internet Mapping Service. County maps as pdf’s can be retrieved from www.dot.nd.gov/road-map/county-base/index.htm.

The following steps explain how a plan title sheet can be created. There could be several variations to this process.

1. Open the Arc Internet Mapping Service (Arc IMS). Two versions of this tool are available. The Intranet version is only available to NDDOT employees and is located at <http://gis.dot.state.nd.us/projects/coversheet>. The external version, available to everyone, is located at <http://web.apps.state.nd.us/hubexplorer/quickmap>. These instructions are written for the Intranet version. However the external version is similar to the Intranet version.
2. Arc IMS should retrieve a map of the entire state of North Dakota. Be patient, it may take several seconds to retrieve the map. On the left side of the map there should be a tool bar with relatively self explanatory tools. Hover your cursor over these tools to learn what each tool does. A text description of the tool should appear. Use the zoom and pan commands to generate and view a map similar to what you want to use for your design plan sheet.
3. The Arc IMS Design Cover Sheet has additional tools that can help you navigate to a specific location in the state by selecting either a;
 - a. Highway and Reference Point
 - b. City
 - c. County
 - d. Section, Township and Range

Select the “Zoom” tool near the bottom of the left tool box. Options to select a location will appear near the bottom of the screen. Select the “GO” button to navigate to the selected location.



CADD Standards

On the right side of the map there should be a list of layers. These layers can be turned on and off similar to ArcMap and MicroStation Levels. Set the layers “on” or “off” as needed. See the Layer and Scale Settings table at the end of this section. Don’t worry about the active level feature. It is not directly used in the map creation process. Also note that certain levels are only available at certain scales. More levels are available as you zoom in.

4. Once you have created a view that you will want to use for your map. Click the “Print” tool from the tool bar. Note your view of the image and the actual map that will be generated will be slightly different. The Generated image will have a 15x9.5 aspect ratio – size.
5. After you have activated the “Print Image” tool, you should have some options at the bottom of your screen.
 - a. Set the Layout to “PDF”
 - b. Set the DPI to “600”
 - c. Select a “Landscape” or “Portrait” orientation.
 - d. Click Create Cover Sheet
6. A link to the newly created map should appear at the bottom of your screen. Open this link to the file and save the file to the appropriate project directory. At this point the Arc IMS procedure is basically done and can be closed.
7. The PDF made from ARC IMS can be referenced from a MicroStation XM drawing. If needed, the MicroStation Clip mask – boundary tools can be used to further process the image within the drawing.
8. The PE stamp is not required for the Haul Road Maps. Use the Plan sheet (Plan3) without title blocks.

CADD Standards

Layer and Scale Settings

Layer Name	Plan Title Sheets	Haul Road Maps
Minor Cities	on (visible)	on
County Seats	on	on
Major Cities	on	on
Reference Points	off	off
Restricted Construction Haul Roads	off	on
Subdivisions	*	off
City Roads	on	on
County Roads	on	on
State Roads	on	on
Ramps	on	on
State Projects - Last + 4 years	off	off
Utility	off	off
Railroads	on	on
Water Lines	on	on
Water Area	on	on
Waterfowl Area	on	off
Wildlife Mgmt	on	off
Park Boundary	on	off
Misc Boundary	on	off
Corporate Boundaries	on	on
Sections	on	on
Reservation Boundaries	on	on
County Boundary	on	on
DOQQ - 50%	*	off
DOQQ	*	off
Water Names	on	on

* Generally off, unless applicable to project

	Plan Title Sheets	Haul Road Maps
Recommended Arc IMS Scale	126 (x 1,000)	250-500 (x 1,000)

CADD Standards

7.3 Tags, Professional Stamping and Signing

Oct 2008

Most Consultants and NDDOT Districts don't have Digital InterPlot or Axiom Title block Manager. However, these people still need to use the same sheet library (sheets.cel) and still have to address the professional engineer stamping requirements. The following notes discuss how these users can operate.

1. The sheets library has been modified. Most of the title blocks for the sheet cells have been filled with "tags". Tags are special MicroStation elements that look like "text" elements.
 - a. These tags have been added so that the sheet cells can be used with Axiom Title Block Manager. However, you don't need TBM to edit these tags. The tags can be edited with just the MicroStation "Edit Tags" tool.
 - b. Title block tags can be deleted without dropping the cell. So if you don't want to use them, they can be deleted and you could fill out the title blocks with normal text. However, the Standard Committee recommends using the "Edit Tags" tool. The preformatted tags are setup with the standard symbology.
2. Several of the standard sheets have a title block for a profession engineer's or registered surveyor's stamp. A special note is included in these title blocks. The note must be included when the drawing is transmitted electronically. Do not fill in the PE stamp tags until the plan sheet has been sealed by a PE. By filling in this information, you are stating the sheet has been sealed. In order to avoid having to maintain two versions of a drawing (one for stamping and one for electronic distribution), special print drivers and pen tables are being used to control when the PE note is printed and when it is not printed.
 - a. The following files are for people that don't use Digital InterPlot. They are located in the s:\standards\XM\plotdrv directory.

Print Driver Name	Function
NDDOT_PE.plt	Most NDDOT Districts Users should use this print driver. This driver will print in black and white. It will not print DIP tags or the PE electronic distribution note.
NDDOT_Black.plt	NDDOT_Black_and_White_for_Electronic_Distribution.plt - This driver will print in black and white and it will print the PE electronic distribution note. It will not print DIP tags.
NDDOT_Color.plt	This driver will print in color and it will print the PE electronic distribution note. It will not print DIP tags.

- b. The above print drivers work in conjunction with the following MicroStation pen tables;
 - i. For_PE_Stamping_w_Date_Name.tbl
 - ii. Date_Name.tbl

CADD Standards

3. The title sheet has several signature lines. When the design plans are electronically distributed or archived, these signature lines need to be electronically filled out. The signatory name should be spelled out followed by characters “/s/”. These lines should only be filled out after the plans have been signed. The text used for the signature line should be on the level named “Sht Stamp Text” so that it is displayed through the pen tables in a manor similar to the standard “Electronic Distribution Statements”.

<p>APPROVED DATE <u>1/8/05</u></p> <p><u>Francis Ziegler /s/</u></p> <p>OFFICE OF PROJECT DEVELOPMENT ND DEPARTMENT OF TRANSPORTATION</p>	<p>I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of ND.</p> <p>APPROVED DATE <u>1/8/05</u></p> <p><u>Roger Weigel /s/</u></p> <p>NDDOT DIV-DIST OR CONSULTANT FIRM</p>	<p>This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 1/8/05 and the original document is stored at the North Dakota Department of Transportation</p>
<p>APPROVED DATE _____</p> <p>_____ FEDERAL HIGHWAY ADMINISTRATION U.S. DEPARTMENT OF TRANSPORTATION</p>		

CADD Standards

7.4 Change Orders (from Plan Revisions)

July 2006

All change order information from Design will be kept in the change order folder located in the designers corresponding project directory (see [Section 2.1](#)). A new change order folder (followed by a letter) shall be added for each change order that is issued (Ex. ChangeOrder_A.) When the next change order is added, the folder should end with the next letter in the alphabet. When starting a change order, check the other designer's folders for existing change orders. If someone is already working on a change order, check to see if your sheets can be added to it.

Examples: R:\project\80046083.017\BRIDGE\ChangeOrder_A
R:\project\80046083.017\BRIDGE\ChangeOrder_B
R:\project\80046083.017\TRAFFIC\ChangeOrder_A
R:\project\80046083.017\DESIGN\ChangeOrder_C

Change orders will be assembled in the same manner that the Design Plans are assembled except that the words "Revised" or "Sheet Added", as applicable, shall be placed directly under the project number in the upper right title block.

The original MicroStation design files should not be modified for a change order. If changes need to be made to a file, the file should be copied into the change order folder and the change order group letter should be added to the end of the filename (Ex. 060PP_004_PP_CO_A).

If design details were documented in one drawing then referenced in cut sheets, then the change order details should be documented in one drawing then referenced in cut sheets.

Example: A driveway should not be built at the location shown in the original design plans. Originally the driveway information was specifically drawn in the file R:\project\80046083.017\DESIGN\design.dgn then referenced into R:\project\80046083.017\DESIGN\Sheets\060PP_006_pp_geelan1.dgn. The person creating the change order drawings should create new drawings named "design_CO_A.dgn and 060PP_006_pp_geelan1_CO_A.dgn. Note that the file name uses a suffix modifier "CO_#," where # is the change order group letter.

The change order modifications should only be made to the new files within the Change Order folders. Include only the features that have changed from the original design.dgn file to the design_CO_A.dgn. The change order driveway would be drawn within

R:\project\80046083.017\DESIGN\ChangeOrder_A\design_CO_A.dgn and then referenced and clipped into

R:\project\80046083.017\DESIGN\ChangeOrder_A\Sheets\060PP_006_pp_geelan1_CO_A.dgn. The 060PP_006_pp_geelan1_CO_A.dgn should reference the original drawing 060PP_006_pp_geelan1.dgn. Remember to use a reference nest depth of "1" in order to reference the original sheet and all of its references.

CADD Standards

When changes are made to a drawing that is referenced into other drawings, all parties involved in making the original plans shall be notified of the changes and the location of the new change order drawing.

Most change order drawings reference the original design drawings. Referencing is usually preferred over copying because changes can be quickly identified and it is less redundant. However, there are exceptions to referencing for change orders.

Some change order files need to be copied from the original design file and then edited in order work with GEOPAK. The GPK file and Cross Section files should be copied from the original design folder.

Drawings that do not have reference files attached or drawings with extensive changes can be copied directly into the Change Order folder and do not need to be referenced back into the new change order drawing. All of the changes can then be made in the change order drawing. For example, a detailed drawing of a Lift station may have many revisions. This drawing could be copied from the design folder into the Change Order folder.

Remember to rename these copied drawings with the change order “CO_#” suffix modifier.

The element symbology for change order drawings should be the same as the symbology used for the design plans.

CADD Standards

7.5 Roadway Inventory Management System (RIMS)

Oct 2008

The Roadway Inventory Management System (RIMS) tool can export information to a PDF. Exporting plan quantity sheets is done by one method. Exporting Milestone dates is done by a different method. Cost estimates can be exported by either method.

The process to print the cost estimates, plan quantity sheets and milestone reports from RIMS to a PDF is similar to printing to paper. This manual does not intend to explain how to use RIMS. This manual only indicates that options to print to a PDF are available.

Exporting Plan Quantity Sheets or Cost Estimates

The PDF options for Plan Quantity Sheets and Cost Estimates have been added as RIMS prompts. For example, the prompts “Print Quantity Sheets to PDF” and “With Boxes/Borders” are found on the same page as where you enter the “Beginning Sheet Number” for the quantity sheet (RIMS page DT3353).

Note, the PDF option in RIMS does not say where the PDF file is saved or what the file is named. The files are saved at: **O:\98 Conversion Folder\Estimates.** The files are named using your user ID. Example, a PDF file printed by Jon Collado would be created by RIMS as: **JONCOL1.PDF.** If you are printing multiple pdf's, you must move and or rename your first PDF or else it will be replaced by the second PDF. You cannot have two of the same file names within the same directory.

CADD Standards

The following “RIMS – Printer ID” table is has been added for quick reference. This table lists most printers used by Design. To see a complete list of available RIMS printers, use your “F1” key within the RIMS “Printer ID” field.

RIMS – Printer ID	Size	Printer Name	Typical Use
T072	Portrait Normal	Environmental Section	
T073	Portrait Condensed	Environmental Section	Cost Estimate
T074	Landscape Normal	Environmental Section	
T075	Landscape Condensed	Environmental Section	
T080	Portrait Normal	Design Laser 3	
T081	Portrait Condensed	Design Laser 3	Cost Estimate
T082	Landscape Normal	Design Laser 3	
T083	Landscape Condensed	Design Laser 3	
T084	11x17 Landscape Condensed	Design Laser 3	Quantity Sheets
T085	Portrait Normal	Design Laser 8	
T086	Portrait Condensed	Design Laser 8	Cost Estimate
T087	Landscape Normal	Design Laser 8	
T088	Landscape Condensed	Design Laser 8	
T373	11x17 Landscape Condensed	Design Laser 8	Quantity Sheets
T630	Portrait Normal	Design Laser 1	
T631	Portrait Condensed	Design Laser 1	Cost Estimate
T632	Landscape Normal	Design Laser 1	
T633	Landscape Condensed	Design Laser 1	
T634	11x17 Landscape Condensed	Design Laser 1	Quantity Sheets

CADD Standards

Exporting Milestone Reports or Cost Estimates to PDF

The PDF options for Milestone Reports and Cost Estimates have been added as RIMS Printers (ID – identification codes) and Print Sequence Numbers.

RIMS-Printer ID	Print Sequence Number	Size Characters per Inch (CPI) Lines per Inch (LPI)	Typical Use
PDF	1	Portrait, 12 CPI, 6 LPI	
PDF	2	Portrait, 12 CPI, 8 LPI	
PDF	3	Landscape, Layout Compressed	
PDF	4	Landscape ,Condensed Font, 18 CPI	
PDF	5	Portrait, 18 CPI, 10 LPI	Milestone Reports, Cost Estimates

Most users will print to the “Printer ID: **PDF**” and “Print Seq No: **5**”. When the report is printed to a PDF, it will be stored on the state FTP site (<ftp://ftp.state.nd.us/public/RIMS/>). Contact your supervisor or the CADD specialist if you need the password and user ID. Your file will be name after your RIMS User ID, Year, Month, day and Time (example, JONCOL1.080917085600.PDF).

Additional Notes

- Adobe (PDF) Readers versions 6.0 may have problems correctly printing multiple pages directly to a printer. These pages may have to be printed one at a time or printed as an image. Printing a PDF as an image is an option in the “Print” dialog box.
- PDF’s of the Quantity sheets and other should be stored in the project Directory.
- PDF’s of Cost Estimates should not be stored on a shared directory or drive. They should not be stored in the Project Directory or FileNet. They should not be stored on a public FTP site (they need to be moved off the site once created). Cost estimates can be stored on your C: drive. Cost Estimates are sensitive documents. Users must use discretion when sharing this information.

CADD Standards

7.6 Incorporating Microsoft Word and Excel Documents in PDF Plan Sets

Oct 2008

Plan sets contain some sheets that are created from Microsoft Word and Excel. These sheets include the Table of Contents, Notes, and Traffic Control Devices List.

1. There are templates available for these sheets on the Plan Preparation Guide website at <http://www.ugpti.org/dotsc/prepguide/index.php>. These are special sheets that have macros built into them for printing.
2. Put the page numbers in the upper right-hand corner.
3. When printing these sheets, do not use the File => Print option from the menu bar. Instead use the following method to print the sheets:
 - a. The Table of Contents and Notes sheets have dialog boxes that launch when you first open the files. If you accidentally closed the dialog boxes, they can be opened by closing and then reopening the file.
 - b. The Traffic Control Devices List has a Print Plan Sheet button located at the top of the Input sheet.

7.7 Incorporating Other Windows Based Programs in PDF Plan Sets

Oct 2008

1. Create an electronic version of the plan sheet by printing the plan sheet to the ProjectWise InterPlot Organizer Printer Driver. To create an electronic version of your file follow these steps:
 - a. Open your document and activate the print command.
 - b. You should have options to choose a printer. Choose "ProjectWise InterPlot Organizer Printer Driver" and click on the "Properties" button.
 - c. Select Landscape and press the "Advanced" button.
 - d. Choose the Tabloid paper size and press OK three times.
2. During the last step of converting the plan sheets, a dialog box for InterPlot will open showing you where the files will be saved and what their names will be. Unfortunately, we cannot change the names or locations of the files. Take note of the file names so that when you change the name you will know which file is which.
3. Move the files that were just created from C:\Iplot to your project folder. Rename the files with the standard naming conventions (see [Section 2.2](#) and [Appendix A](#).)
4. If this is a plan sheet that requires sealing by a PE, you will need two versions of the files; one with the electronic distribution statement and one without it. The version without the statement is needed for preliminary and PS&E plans. The version with the statement is needed for final plans, addendums, change orders, and as-builts. Do not put the statement on these plan sheets until it has been sealed by a PE.

CADD Standards

7.8 Scanning Documents into PDF Plan Sets

Oct 2008

1. Assemble the plan sheets and put the section and page numbers in the upper right-hand corner.
2. Scan the plan sheets and save them into the appropriate project directory with the correct file name (see [Section 2.2](#) and [Appendix A](#).)
3. If this is a plan sheet that requires sealing by a PE, you will need two versions of these sheets; one with the electronic distribution statement and one without it. The version without the statement is needed for preliminary and PS&E plans. The version with the statement is needed for final plans, addendums, change orders, and as-builts. Do not put the statement on the plan sheet until it has been sealed by a PE.

CADD Standards

Miscellaneous Help

8.1 Using MicroStation Files in Microsoft Word

Oct 2008

There are several ways to export a MicroStation drawing to a format that can be imported into Microsoft Word. The following is a list of some of the common methods.

1. Windows Cut and Paste
2. Print Screen
3. MicroStation Image Capture Tool
4. Print Drawing to an Image file
 - a. Encapsulated Postscript (.eps)
 - b. Tagged Image Format (.tif)
 - c. Joint Photographic Expert Group (.jpg)
 - d. Microsoft Document Imaging
 - e. Clear Water
5. Object Linking and Embedding (OLE)

Window Cut and Paste is one of the easiest way to bring a drawing into Word. However, the image quality is poor. Linestyles appear altered. Sometimes text is not exported. Images imported using this method are not typically good enough for reports. This procedure is not documented in this manual.

Print screen is another easy way to bring a drawing into Word. This method usually requires considerable cropping once imported into Word. The background color usually needs to be changed to white. Image quality is OK. This procedure is not documented in this manual.

The MicroStation Image Capture tool can be used to export images to a wide variety of image file formats. This tool allows for cropping during the export process. The background color usually needs to be changed to white. Image quality is OK. This tool can be found in the main MicroStation pull down menu “Utilities>Image>Capture”. No further documentation on this procedure is given in this manual.

Using MicroStation printing tools to export a drawing to an image file is typically the best method to use for most NDDOT reports in the Word document format. Good image quality can usually be maintained. There are numerous variations with this process. The active background color used during the export process is less of a concern.

Object Linking and Embedding (OLE) is used bring drawing elements into Word as objects. If the objects are embedded into word, they can individually be edited with Word tools. If the objects are linked, the image can be updated from the MicroStation drawing. This process is typically used for complex living documents. This process is also used when someone will need to edit the image in Word instead of recreating the image in MicroStation. Raster files don't work with this process.

CADD Standards

Printing a Drawing to an Image File

There are several variations of this process. This manual will discuss how to export an “encapsulated postscript” (.eps) file from MicroStation. This format is recommended for word documents because file sizes are small and image integrity is good.

The same techniques used to print a drawing to paper, using MicroStation print tools, are used to print a drawing to an image file. The main difference is that different plot drivers are used.

Several plot drivers have been modified for NDDOT use. They are located at:

S:\STANDARD\XM\plotdrv. From the MicroStation “Print” dialog box, select “File>Select Bentley Driver”. The “Select Bentley Driver File” dialog box should open. In order to create an eps file select S:\STANDARD\ XM \plotdrv\NDDOT_epscripc.plt. When you print the drawing, you will be prompted for an eps file name and a location to save the file.

Once the image file (*.eps) has been created, it can be imported into Microsoft Word. In Word, select “Insert>Picture>From File”. Then select the eps file.

Object Linking and Embedding

Within MicroStation

1. The first step is optional. If the final image in word is going to be black and white, image quality – contrast can be improved by first changing the drawing to black and white. Turn on Level Symbology and temporarily turn every level that is going to be printed to white.
2. Load the Object Linking and Embedding (OLE) mdl.
3. Under the pull downs, click on "utilities" & select "key-in".
4. Type "mdl load oleserve" and hit the enter key.
5. Capture the view object:
 - a. Zoom in on the image as close as possible. Everything in the window will become the image.
 - b. Type "oleserve viewcopy 1" in the key-in box and hit the enter key. Use the appropriate view number. This key-in assumes you are using view 1. If you were using view 2, you would type “oleserve viewcopy 2”.

CADD Standards

Within Microsoft Word

Embed or link the view object. Embedding views is recommended for the average user. Changes to the MicroStation Drawing will not change previously embedded drawings. Linked view objects will change with changes in the MicroStation Drawing. Linking objects is not discussed in this document.

1. In Word, from the pull down menus select "edit", then "paste special", then "Paste: Picture".
2. Optional Microsoft Word Formatting. Note, sometimes elements may be lost during this formatting process.
 - a. Left click on picture.
 - b. Right click over picture and select "edit picture".
 - c. In order to select all elements, left click in the lower left corner, hold down, and drag curser to upper right corner, and let up. All items should be selected (have dots).
 - d. Put curser over a dot & right click, select "format object".
 - e. Under "colors and lines" tab, select black for line and 1/4 pt for style. Click OK.
 - f. From the "Drawing Canvas" menu, click "fit" twice.
 - g. From the "Drawing Canvas" click "scale drawing" to adjust the scale as desired. Go to page setup to use landscape if desired. Then readjust the scale so it fits.
 - h. Individual line styles can be adjusted if desired. Follow the procedure above using the "format object".

CADD Standards

8.2 Bentley View

Oct 2008

If you don't have MicroStation and you just want to view and print CADD drawings, this might be the tool for you. This tool is relatively easy to use and it is free. People like district engineers and administrative assistants could use this tool to view and print MicroStation drawings.

Exporting drawings to PDF takes little time. However, some reviews benefit from eliminating even the smallest step. If all reviewers have CADD viewers, drawing preparation effort is minimized. Bentley View does not "push" the information to the end user as much as PDF, but it is more flexible in terms of not needing to process drawings into another format. Bentley View reads directly from raw CADD - dgn files.

Some people don't have MicroStation installed on their computer. It is not practical for them to become proficient nor is it cost efficient to install a full version of MicroStation on their computer. But occasionally they may need to review a drawing, (example a drawing was sent to them by email). If this person had Bentley View, they would not have to ask the sender to convert the drawing to another format or ask someone with MicroStation to help them view the drawing. They could view and or print the drawing themselves.

This tool is free and is relatively easy to use. Addition help using Bentley View can be found in its own help files.

NDDOT personnel should submit a work order request through the Work Management System if they want Bentley View loaded on their computer.

Note, privileges to certain servers for certain uses may need to be adjusted. Some people may benefit if they had access to the CADD Server.

CADD Standards

8.3 Extracting a XYZ File from ArcMap (National Elevation Dataset)

July 2007

This section is about extracting northing, easting and elevation data from a USGS Digital Elevation Model using ArcMap. There are numerous reasons why you may want to do this. One possible reason is so you can make a GEOPAK TIN and draw USGS contours in MicroStation. This task can be separated into 3 broad steps;

1. Extract and Create XYZ text file
2. Create a GEOPAK TIN (digital elevation model – triangulated irregular network)
3. Create a drawing of contours from a GEOPAK TIN

This section focuses on the step “Extract and Create XYZ file.” The last two steps are documented in the GEOPAK help files. The last two steps are also documented in the “North Dakota Procedures for Calculating Final Earthwork Quantities” under the sections “Creating a Digital Terrain Model (DTM)” and “Reviewing and Displaying a DTM”.

The first step of extracting XYZ ground coordinates from United States Geological Survey raster is the step CADD Users might not be aware of. This task is interesting because ground information can be extracted from any place in North Dakota. ArcMap Spatial Analyst and the National Elevation Dataset can be used to extract information into an XYZ file and then it can be imported into GEOPAK.

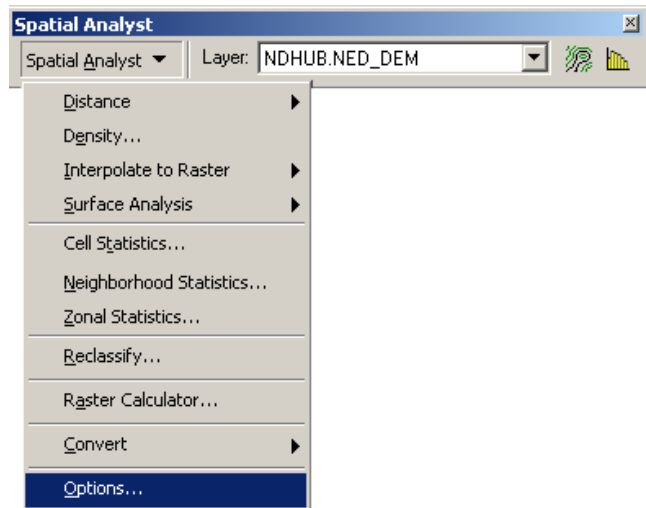
The USGS data is very rough. These maps seldom show enough detail to see roads or do earthwork, but they will give you a general idea of the terrain. They will give enough detail to delineate large drainage areas. This topography may also be helpful in evaluating general locations such as wetlands and borrow sites.

The following steps elaborate on the broad step of “Extract and Create XYZ Text File”.

1. Fundamental ArcMap skills are needed for this task such as adding data layers and view controls. If you don’t have fundamental ArcMap skills, you will most likely need help to complete this task.
2. Confirm that you have access to the needed resources.
 - a. ArcMap
 - b. Access to the ndhub.sde (North Dakota Spatial Database)
 - c. Access to the ArcMap Extension (Spatial Analyst). The NDDOT shares one license.
 - d. ArcMap ground projections for the needed counties. These projections can be downloaded from the NDDOT GIS web page.
 - e. MicroStation
 - f. GEOPAK

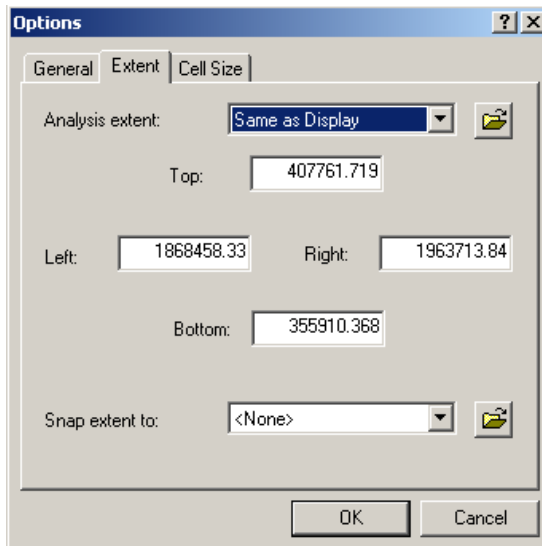
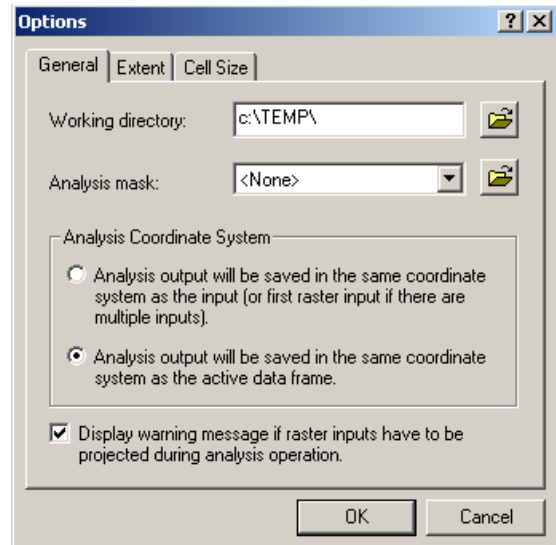
CADD Standards

3. Open ArcMap and create a map with enough data - layers so that you can zoom in on the desired project area. Zoom in on the project area. Some of the following steps will be view dependent.
4. Add the data layer NDHUB.NED_DEM from the ndhub.sde (North Dakota Spatial Database).
5. Change the projections of your data frame to one of the NDDOT ground coordinate systems. Each county has its own projection. If you don't set the correct ground projection, your data will not be extracted correctly.
6. Activate the "Spatial Analyst" extension in ArcMap by selecting "Tools>Extensions". Then select "Spatial Analyst". Find or open the "Spatial Analyst" Tool Bar by selecting "View>Toolbars>Spatial_Analyst".
7. Use the Spatial Analyst tools to extract a smaller (project) layer from the NDHUB.NED_DEM. It is not practical to extract all of the information from the main NDHUB.NED_DEM layer. Large extractions are very cumbersome to work with and they take a long time to process.
 - a. From the Spatial Analyst tool bar select "options".



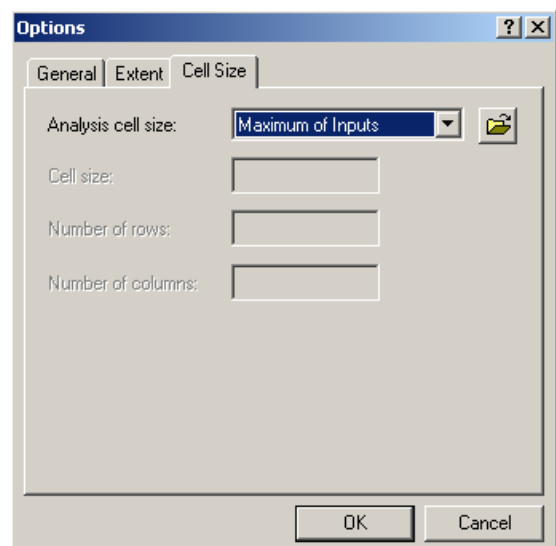
CADD Standards

- b. From the “Options” dialog box set your “Working directory”. Several ArcMap files will be saved in this directory. Set the “Analysis Coordinate System” to the same as active data frame.



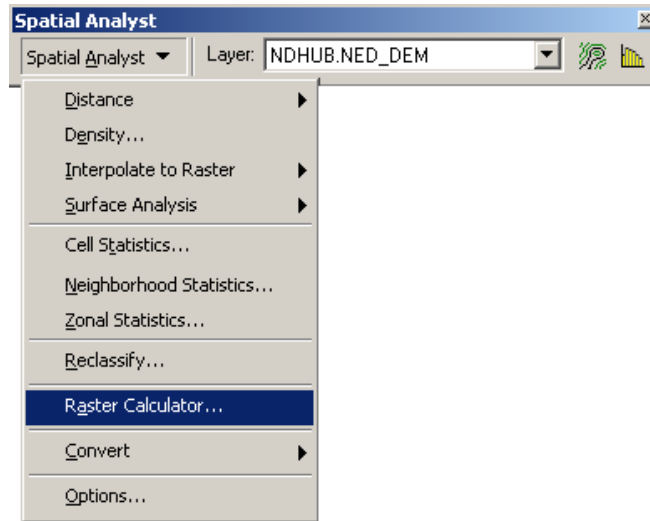
- c. Go to the “Extent” tab and set the “Analysis extent:” to “Same as Display”. The top, left, right and bottom coordinates should change.

- d. On the “Cell Size” tab, the “Analysis cell size:” should be on “Maximum of Inputs”. Select the “OK” button after the options have been set.

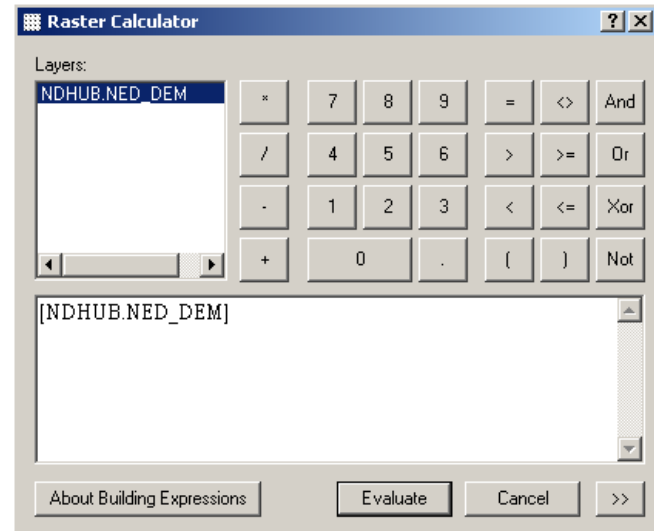


CADD Standards

- e. From the Spatial Analyst tool bar, select “Raster Calculator”.

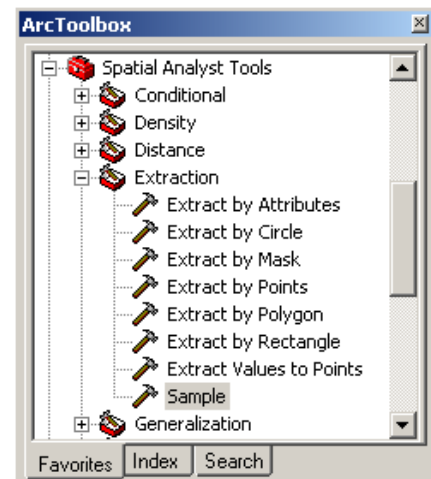


- f. From the Raster Calculator dialog box, double click on the layer “NDHUB.NED_DEM” to add the layer to your calculation. Then select the “Evaluate” button. ArcMap should extract a smaller layer from the NDHUB.NED_DEM layer. This may take several seconds. The new layer will be saved in your working directory. It will be added to your map and will be named something like “Calculation...”



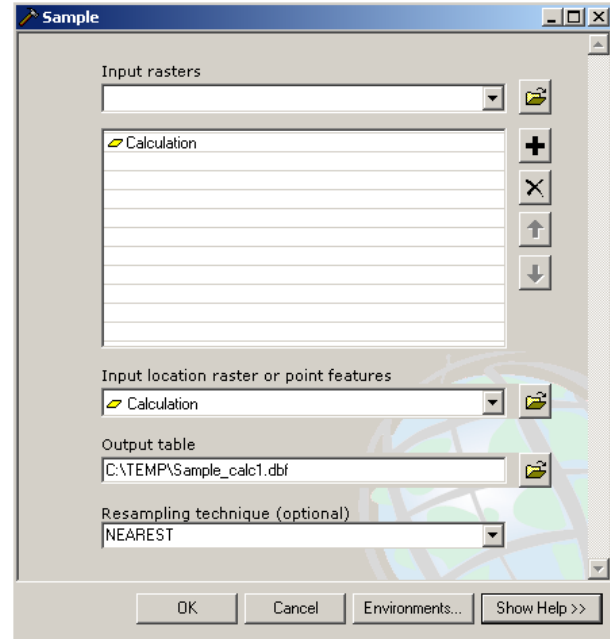
8. Sample the coordinates from the new “Calculation...” layer.

- a. Open the Sample tool from ArcToolbox>Spatial_Analyst_Tools>Extraction.



CADD Standards

- b. Select the raster dataset as the Input Raster.
- c. Select the raster dataset again in the “input location raster or point features” drop down.
- d. Make sure “Resampling technique” is set to NEAREST.
- e. Specify an output table.
- f. Click OK



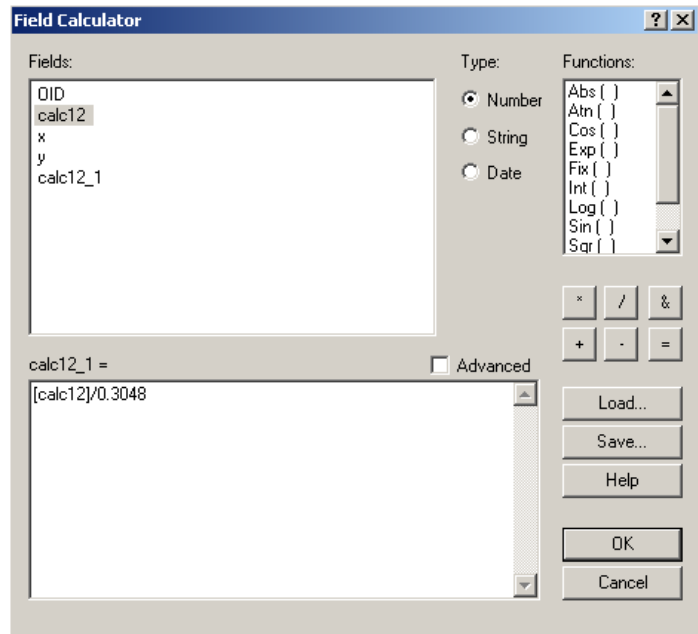
- g. Open the table in ArcMap. Note the units of elevations are in meters and the units of northings and eastings are in feet. The table should have 5 fields;OID (object Identification number), calc* (elevation in meters), easting, northing, calc*_1.
- h. Now would be good time to convert the elevation field into “feet”. The last column (calc*_1), doesn’t contain relevant information. Right click on the column heading. A popup menu should appear, select “Calculate Values...”.

OID	calc12	x	y	calc12_1
0	495.7577	1889611.16564	386594.996431	
1	495.5004	1889692.74516	386594.996431	
2	495.4706	1889774.32468	386594.996431	
3	495.4581	1889855.9042	386594.996431	
4	495.6565	1889937.48372	386594.996431	
5	495.7017	1890019.06324	386594.996431	
6	495.7123	1890100.64276	386594.996431	
7	495.724	1890182.22228	386594.996431	
8	495.724	1890263.80179	386594.996431	
9	495.724	1890345.38131	386594.996431	
10	495.9265	1890426.96083	386594.996431	

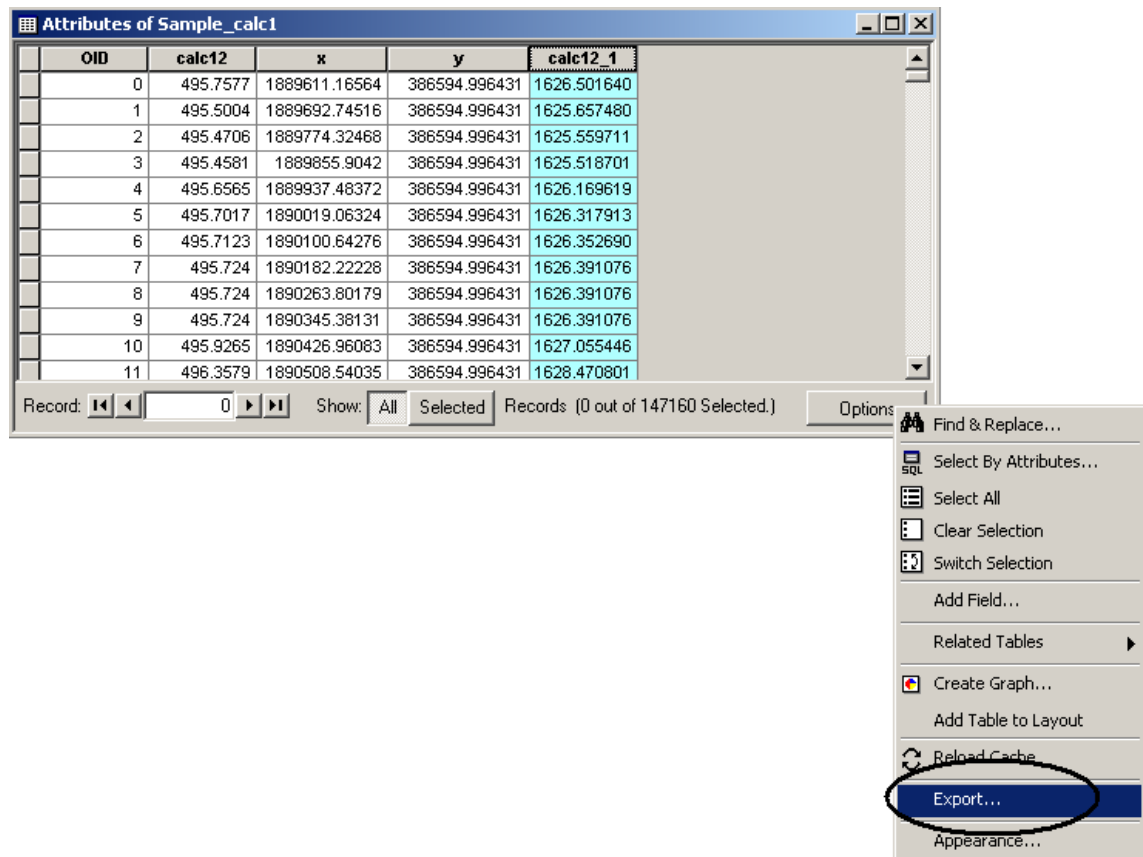
- i. You may get a warning about doing calculations outside of an edit session. Select Yes.

CADD Standards

- j. In the Field Calculator, create an equation to convert records in the second column from meters into feet such as “[calc12]/0.3048”. Then select “OK”.

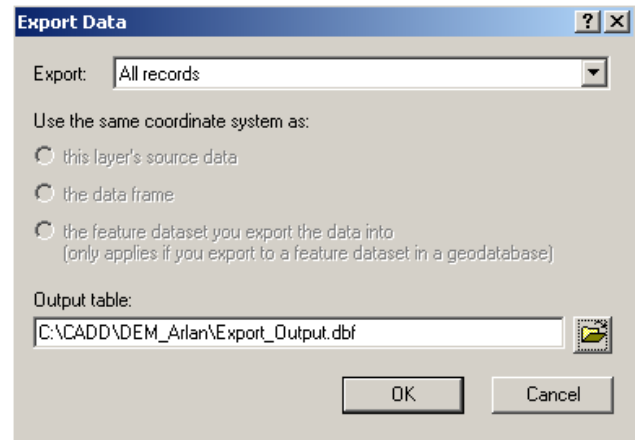


- k. After you have converted the last column into elevation feet, export the table to text file by selecting the “Options” button and picking “Export”.



CADD Standards

- l. Set Export to “All Records”.



- m. Click the browser button next to the output Table field.
- n. Set “Save as type” to “Text File” and set an output location and filename. Click Save.

- o. Click OK on the Export Data dialog box. The Output text file should look similar to this. Note the OID (object identification number) was not exported. This isn't important. We only need to be able to retrieve information from the easting, northing and elevation (feet) fields.

```
"OID_","calc12","x","y","calc12_1"  
,495.75,1889611.16,386594.99,1626.50  
,495.50,1889692.74,386594.99,1625.65  
,495.47,1889774.32,386594.99,1625.55  
,495.45,1889855.90,386594.99,1625.51  
,495.65,1889937.48,386594.99,1626.16  
,495.70,1890019.06,386594.99,1626.31  
,495.71,1890100.64,386594.99,1626.35  
,495.72,1890182.22,386594.99,1626.39  
,495.72,1890263.80,386594.99,1626.39  
,495.72,1890345.38,386594.99,1626.39  
,495.92,1890426.96,386594.99,1627.05  
,496.35,1890508.54,386594.99,1628.47
```

- p. In a text editor delete the header field from the exported text file; this will simplify importing the text file into GEOPAK.
- q. This concludes the ArcMap task of extracting XYZ ground coordinates from United States Geological Survey raster. This information can now be imported into GEOPAK. See the GEOPAK help files or “North Dakota Procedures for Calculating Final Earthwork Quantities” under the sections “Creating a Digital Terrain Model (DTM)” and “Reviewing and Displaying a DTM” for the remaining steps.

CADD Standards

8.4 Important Tips for Printing PDF Plan Sets

Oct 2008

Most plan sets are printed on 11"x17" paper with a paper orientation of "Landscape". Confirm these print settings before printing.

Avoid printing color plan sets in black and white. Black and white pdf files should be used to print black and white prints.

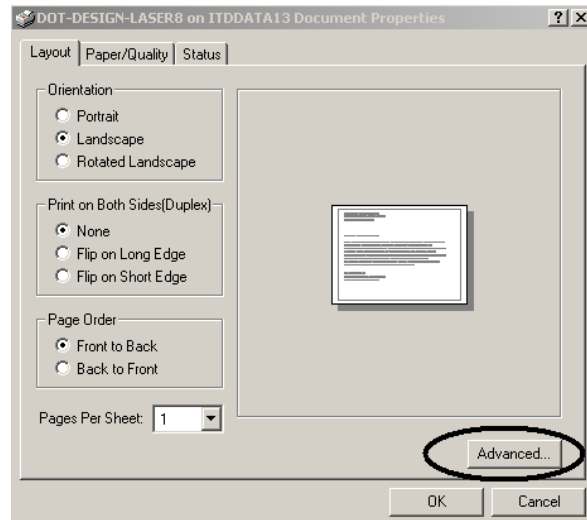
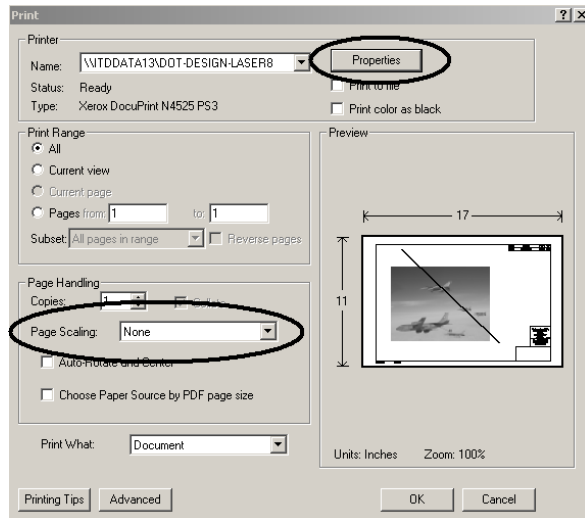
Printers often model the different colors in different shades of gray. The paper print may misrepresent what is in the file. Example, a thick cyan line (weight =3) and a thick blue line (weight =3) should look the same when printed in black and white. However the blue line may appear thicker or heavier than the cyan line on certain printers.

The "Print color as black" option may correct the gray scale misrepresentation, but the "print color as black" option may also cause all the grays in a photo or raster to print completely black, making photos illegible.

CADD Standards

Most drawings have been made so that they print at a specific scale. Users need to be careful not to let your individual pdf reader settings or the printer settings adjust this scale. Most adobe – pdf readers and some printers do this by default.

The scaling settings need to be turned off – set to “None”.



On some printers such as Design’s Xerox 4525 printers (black and white), the “edge to edge” setting needs to be enable under the advanced settings.

There are several different versions of pdf readers, hundreds of different printer models, and a very diverse group of users that print plan sets. This is an awareness issue. Learn the settings for your situation needed to print a set of plans to scale.

